TM 8-6515-004-24&P

TECHNICAL MANUAL

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

SUCTION APPARATUS, OROPHARYNGEAL MODEL 308M

6515-01-304-6497

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

HEADQUARTERS, DEPARTMENT OF THE ARMY

October 1993

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

Do not try to pull or grab the individual.

If possible, turn off the electrical power.

If you cannot turn off the electrical power, pull, push, or lift the person to safety using a dry wooden pole or a dry rope, or some other insulating material.

Send for help as soon as possible.

After the injured person is free of contact with the source of electrical shock, move the person a short distance away and immediately start artificial resuscitation.

Throughout this manual are WARNINGS, CAUTIONS, and NOTES. Please take time to read these. They are there to protect you and the equipment.

WARNING

Procedures which must be observed to avoid personal injury, and even loss of life.

CAUTION

Procedures which must be observed to avoid damage to equipment, destruction of equipment, or long-term health hazards.

NOTE

Essential information that should be remembered.

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DEPARTMENT OF THE ARMY
WASHINGTON, DC 8 October 1993

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You can help improve this manual. If you find any mistakes or if you know a way to improve procedures, please let us know. Mail your memorandum, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 (Recommended Changes to Equipment Technical Publications) located in the back of this manual, to: Commander, U.S. Army Medical Materiel Agency, ATTN: SGMMA-M, Frederick, MD 21702-5001. A reply will be furnished directly to you.

Approved for public release; distribution is unlimited.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Overview.

This manual describes the suction apparatus (fig 1-1); provides equipment technical data; and provides operational and maintenance functions, services, and actions. Additional information follows:

a. Type of manual. Unit, direct support (DS), and general support (GS) maintenance (including repair parts and special tools list).

b. Model number and equipment name. Model number 308M, Suction Apparatus, Oropharyngeal.

c. Purpose of equipment. To provide a method of suctioning secretions, blood, or vomitus from the upper airway during oropharyngeal and/or tracheal procedures during the emergency treatment of an unconscious or injured patient.

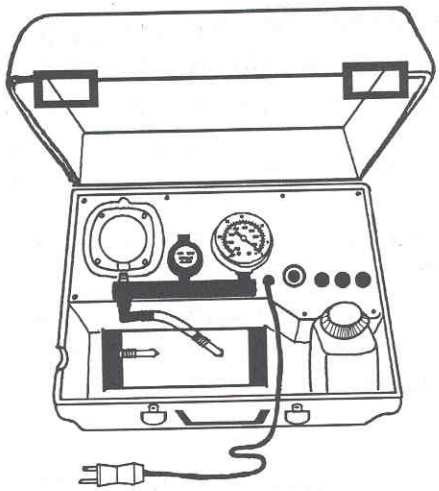

Figure 1-1. Suction apparatus.

1-2. Explanation of abbreviations and terms.

Special or unique abbreviations, acronyms, and terms used in this manual are explained in the glossary.

1-3. Maintenance forms, records, and reports.

TB 38-750-2 prescribes forms, records, reports, and procedures.

1-4. Destruction of Army materiel to prevent enemy use.

AR 40-61 contains instructions for destruction and disposal of Army medical materiel. Also, the SB 8-75 series provides periodic information and/or instructions on the destruction of medical materiel.

1-5. Administrative storage.

a. Place the suction apparatus in administrative storage for only short periods of time when a shortage of maintenance effort exists. This equipment should be in mission readiness condition within 24 hours or within the time factors determined by the directing authority. During the storage period, keep appropriate maintenance records.

b. Perform preventive maintenance checks and services (PMCS) listed in tables 3-2 and 3-3 before placing Army equipment in administrative storage. When equipment is removed from storage, perform PMCS to ensure its operational readiness.

c. Inside storage is preferred for equipment selected for administrative storage.

1-6. Preparation for storage or equipment.

Procedures to prepare the suction apparatus for storing or shipping are listed in chapter 3, section XI.

1-7. Quality control (QC).

TB 740-10/DLAM 4155.5/AFR 67-43 contains QC requirements and procedures.

1-8. Nomenclature cross-reference list.

Table 1-1 identifies official versus commonly used nomenclatures.

Table 1-1. Nomenclature cross-reference list.

Common name	*Official nomenclature*
Battery pack	Battery, rechargeable (2)
Coupling elbow	Elbow, flange to hose
Diode	Semiconductor device, diode
Gasket	Grommet
Litter mounting strap	Strap, nylon, black, webbed
Operating mode selector switch	Rotary switch
Suction apparatus	Suction apparatus, oropharyngeal
Vacuum adjust control (knob)	Valve, vacuum, regulating
Vacuum gauge	Gauge, vacuum, dial-indicating
Vehicle power cord	Auto power cable assembly

NOTE

A suction apparatus is also referred to as an aspirator.

1-9. Reporting and processing medical materiel complaints and/or quality improvement reports.

AR 40-61 prescribes procedures for submitting medical materiel complaints and/or quality improvement reports for the suction apparatus.

1-10. Warranty information.

A warranty is not applicable.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-11. Equipment characteristics, capabilities, and features.

a. The suction apparatus is a self-contained transportable unit with an integral case. It is suitable for use in field hospital treatment areas, ambulances or other patient evacuation vehicles, field environments with no electrical power source, and aeromedical aircraft.

b. The suction apparatus operates from multiple voltages and frequencies as well as an integral battery pack.

c. Electromagnetic interference (EMI) and radio frequency interference (RFI) are controlled by internal circuitry.

d. The suction apparatus includes a power transformer to operate from a 230-volt source of electrical power.

1-12. Component and accessory descriptions.

a. Components (fig 1-2).

(1) *Case.* The dual-wall, high-density, flame-retardant polyethylene case is an integral component of the suction apparatus. It includes a hinged lid, two latches, and a movable carrying handle. The case also includes storage space for the operating accessories.

(2) *Power cable.* The electrical power cable permits operation with a direct connection to a 115-volt receptacle. It is permanently connected to the control panel.

(3) *Collection canister.* The collection canister consists of a butyrate cylinder, black plastic end caps, and nylon tubing connectors.

(4) *Vacuum pump.* The valved, diaphragm type pump with integral electrical motor is located below the control panel with only the black pump head visible.

(5) *"VACUUM ADJUST" control.* The black, serrated control knob is used to regulate the maximum deliverable vacuum level.

(6) *Vacuum gauge.* The round metal vacuum gauge, with clear plastic protective cover, contains dual indicator scales calibrated in millimeters and inches of mercury.

(7) *Operating mode selector switch.* The black, fluted knob with a white position marker is a rotary switch used to control the four modes of operation. The control panel is marked with the operating modes.

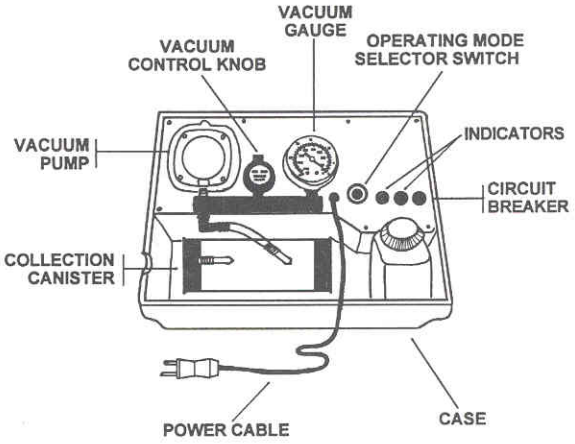

Figure 1-2. Components.

(8) *Indicators.* The two control indicators, which show green when illuminated, are mounted on the control panel.

(9) *Circuit breaker.* The black, button-type circuit breaker provides excessive current protection for the vacuum pump/motor.

b. Accessories.

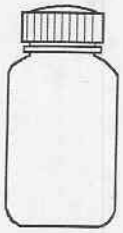

Figure 1-3. Rinse bottle.

Figure 1-4. Litter mounting straps.

(1) *Rinse bottle (fig 1-3).* The translucent plastic rinse bottle holds a water/saline solution to flush the patient suction tube and suction catheter which may become clogged with aspirate.

(2) *Litter mounting straps (fig 1-4).* The two black webbed nylon straps are used in conjunction with the D-ring fasteners mounted on the case to secure the suction apparatus to a litter.

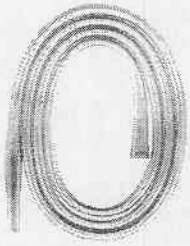

Figure 1-5. Patient suction tube.

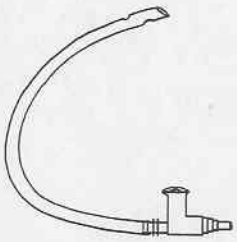

Figure 1-6. Catheter.

(3) *Patient suction tube (fig 1-5).* The sterile 6-foot patient suction tube is used in conjunction with a suction catheter by qualified medical personnel to aspirate a patient.

(4) *Catheter (fig 1-6).* The sterile catheters, furnished in two sizes, are used in conjunction with a patient suction tube by qualified medical personnel to aspirate a patient.

(5) *Tubing (fig 1-7).* The 9-inch sterilizable tubing is used to assist in cleaning the collection canister.

(6) *Power transformer (fig 1-8).* The step-down transformer includes a female, 115-volt receptacle to accept the suction apparatus power cable.

Figure 1-7. Tubing.

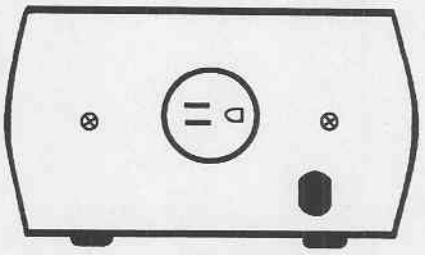

Figure 1-8. Power transformer.

NOTE

The transformer input power cable will be locally fabricated to specific locality/country requirements.

(7) *Vehicle power cord (fig 1-9).* This cord uses a vehicle for its source of 12 VDC electrical power to operate the suction apparatus during patient movement.

NOTE

The vehicle connector, commonly referred to as a vehicle "cigarette lighter," must be removed and replaced with battery terminal spring clips when used in military tactical vehicles.

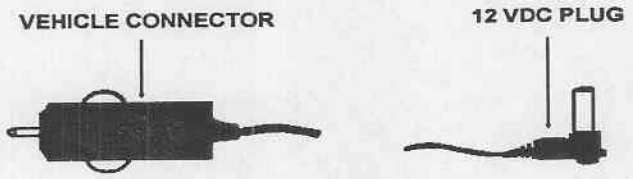

Figure 1-9. Vehicle power cord.

1-13. Tabulated data, decals, and data plates.

The tabulated data provides the miscellaneous characteristics, specifications, and other information for the suction apparatus.

a. Miscellaneous characteristics and specifications. Table 1-2 and table 1-3 provide a broad range of miscellaneous characteristics and specifications to include operating voltages, battery operating time, operating/storing temperature ranges, dimensions, and weights.

Table 1-2. Miscellaneous characteristics.

Dimensions	
Suction apparatus (case)	34 cm W (13.5 in W) X 25 cm H (10 in H) X 15 cm D (6 .13 in D)
Transformer	13.67 cm W (5.38 in W) X 9.53 cm H (3.75 in H) X 18.75 cm D (7.38 in D)
Patient suction tube	0.71 cm id (0.28 in id) X 1.83 m L (6 ft L)
Weight	
Suction apparatus	5.9 kg (13 lbs)
Transformer	1.5 kg (3.25 lbs)
Voltage ranges	
AC	115 VAC, 50-400 Hz or 230 VAC, 50/60 Hz
DC	12 VDC
Temperature operating range	-60°C (-76°F) to 60°C (140°F)
Storage temperature ranges	
Suction apparatus	-15°C (5°F) to 40°C (104°F)
Battery (optimum)	10°C (50°F) to 30°C (80°F)
Battery recharge temperature range	-20°C (-4°F) to 50°C (122°F)
Battery recharge interval (extended storage)	
Below 20°C (68°F)	18 months
20°C (68°F) to 30°C (86°F)	12 months
30°C (86°F) to 40°C (104°F)	6 months

Table 1-3. Specifications.

Vacuum range	0-560 mm/Hg (0-22 in/Hg)
Airflow (minimum)	31 LPM
Collection capacity	680 cm^3 (0.68 L)
Operating time	
Battery pack (maximum vacuum)	20 min (typical)
115 VAC	Continuous
12 VDC	Continuous

WARNING

Use of the suction apparatus should not exceed 27 minutes per hour regardless of its capability to operate continuously from external AC electrical power.

b. Identification, instruction, and warning plates, decals, or markings.

(1) The suction apparatus manufacturer data plate (located on the top outside lid of the case) is depicted in figure 1-10.

SER. NO.
CONTRACT: DLA120-89-C-8574

IMPACT INSTRUMENTATION, INC.
SUCTION APPARATUS, OROPHARYNGEAL, PORTABLE, MODEL 308M
115VAC, 50-400HZ; 12VDC 10A, 120W

DES. ACT. 89875
PART NO. DPSC-DEPMEDS-AT/82A(DM) FSCM 63346

NSN: 6515-01-304-6497 MFD 1Q90

US

Figure 1-10. Manufacturer data plate.

(2) A decal (located on the inside of the case lid) recommending AC usage time is depicted in figure 1-11.

RECOMMENDED AC USAGE
SHOULD NOT EXCEED
27 MINUTES/HOUR

Figure 1-11. Operating time limitation decal.

(3) Operating information (located on the control panel) is depicted in figure 1-12.

« 308 Series »

Recharge batteries as directed in Operating Instructions.

Use external AC or external DC for normal operating power.

Use internal rechargeable batteries when external power is not readily available.

Do not use in the presence of flammable anesthetics.

Pump head may become hot during periods of prolonged use. This will not effect operation

To protect this device against possible aspirate entry, do not operate with lid closed unless overflow filter is used.

Do not clean cannister(s) with alcohol.

Figure 1-12. Operating information stencil.

(4) The power transformer manufacturer data plate (located on the bottom of the transformer) is lepicted in figure 1-13.

SER. NO.

CONTRACT: DLA120-89-C-8574

IMPACT INSTRUMENTATION, INC.

SUCTION APPARATUS, STEPDOWN TRANSFORMER, MODEL 308M
230VAC, 50-60HZ **200VA**

FSCM 63346

DES. ACT. 89875
PART NO. DPSC-DEPMEDS-AT/82A(DM)

NSN: 6515-01-304-6497 **MFD 1Q90**

US

Figure 1-13. Transformer decal.

NOTE

The number following the acronym "FSCM" on the transformer decal is the CAGE code for the manufacturer.

1-14. Model differences.

Model differences are not applicable since this manual covers a single model.

NOTE

The terminology "308M series" is located above the operating information stenciled on the control panel. The official model number 308M designation indicates that the "308 series" suction apparatus has been modified to accommodate an external power transformer for 230 volts.

1-15. Safety, care, and handling.

a. Observe each WARNING, CAUTION, and NOTE in this manual.

b. Read the operating instructions in this manual before operating the unit. The suction apparatus is intended for use by qualified medical personnel only. Refer servicing to qualified Medical Equipment Repairer personnel.

c. Do not operate the suction apparatus more than 27 minutes per hour using AC power.

d. Do not operate the suction apparatus with the lid closed unless an optional bacterial/overflow filter is used.

e. Do not remove the inside control panel. There is a danger of electric shock.

f. Do not use in the presence of flammable anesthetics to preclude a possible explosion.

Section III. PRINCIPLES OF OPERATION

1-16. Basic operation.

a. The suction apparatus consists of a low volume, low vacuum pump, an aspirate collection canister, a valve to control the deliverable vacuum level, and a gauge. The valved, diaphragm type pump creates a vacuum in the collection canister and expels pressurized air through its exhaust valve and port. A rotary knob on the vacuum control valve provides a continuously variable deliverable vacuum level to a patient as determined by qualified medical personnel.

b. The operating mode selector switch permits multiple sources of electrical power and recharging of the internal battery pack.

c. The suction apparatus, when fitted with a patient suction tube and suction catheter, evacuates a variety of material from the patient and into the collection canister.

CHAPTER 2

OPERATING INFORMATION AND INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. Scope.

This manual is primarily intended to provide information, instructions, and procedures for the maintenance of the suction apparatus. The operating information and instructions, while valid, do not provide sufficient information for use of the suction apparatus on a patient. Only qualified medical personnel are trained in specific suctioning techniques and procedures.

2-2. Assembly and interconnections.

a. Assembly. No assembly is required prior to operating the suction apparatus.

b. Interconnections. No interconnections are required prior to operating the suction apparatus.

NOTE

The aspiration of patients will require the connection of a patient suction tube and a suction catheter to the collection canister tubing connector.

Section II. OPERATING INFORMATION

2-3. Controls and indicators.

a. Operating mode selector switch (fig 2-1). This four-position rotary switch is the electrical control switch to start and stop operation of the suction apparatus, the operating voltage selector switch, and the internal battery recharging control switch. The functions of the four switch positions are as follows:

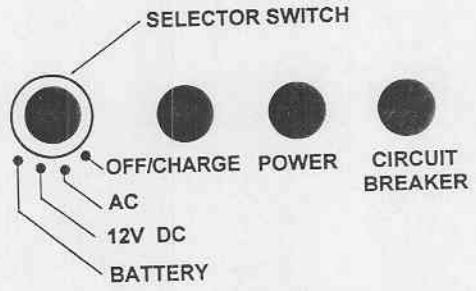

Figure 2-1. Operating mode selector switch.

(1) *"OFF/CHARGE."* This first position of the operating mode selector switch disconnects electrical power to the vacuum pump motor and connects electrical power to the internal battery charger.

NOTE

The green "CHARGE" indicator is illuminated in the "OFF/CHARGE" position of the operating mode selector switch if the charging circuit is operating.

(2) *"AC."* This second position of the operating mode selector switch enables operation of the suction apparatus from multiple voltages and frequencies of external AC electrical power.

NOTE

The green "POWER" indicator is illuminated in the "AC" position of the operating mode selector switch.

(3) *"12V DC."* This third position of the operating mode selector switch enables operation of the suction apparatus from an external 12 VDC source of electrical power.

NOTE

The green "POWER" indicator is illuminated in the "12V DC" position of the operating mode selector switch.

(4) *"BATTERY."* This fourth position of the operating mode selector switch enables operation of the suction apparatus from the internal rechargeable battery pack.

NOTE

The green "POWER" indicator is illuminated in the "BATTERY" position of the operating mode selector switch.

b. "VACUUM ADJUST" control knob (fig 2-2). This rotary valve controls the vacuum level available to a patient. The deliverable vacuum level is set by pinching and holding the clear, plastic tubing connected to the collection canister and then rotating the knob either clockwise to increase the level of vacuum or counterclockwise to decrease the level of vacuum. Release the pinched tubing when the desired maximum deliverable vacuum level is indicated on the vacuum gauge.

Figure 2-2. Vacuum adjust knob.

NOTE

Deliverable vacuum to a patient will not exceed the preset level.

c. Vacuum gauge (fig 2-3). This dual-scale gauge indicates the preset maximum deliverable vacuum level when adjusted and then the gauge continuously indicates the patient circuit vacuum level. The dual-scale vacuum gauge is marked in millimeters and inches of mercury.

d. "CIRCUIT BREAKER" (fig 2-4). The electrical circuit breaker protects the vacuum pump/motor from excessive current during incorrect or prolonged use. When activated, a small cylindrical plunger is released upward in the center of the circuit breaker. Push down to reset it.

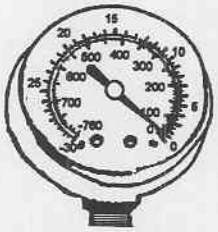

Figure 2-3. Vacuum gauge.

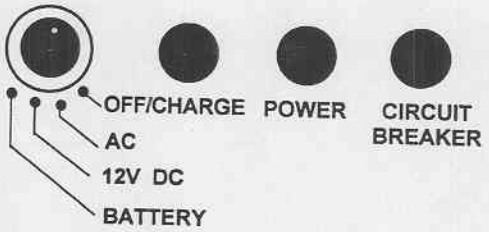

Figure 2-4. Circuit breaker.

2-4. Operational components and accessories.

a. Power cable. This molded electrical power cable is used to provide 115 VAC (nominal) to operate the suction apparatus in "AC" mode or to operate the battery charger for the internal battery pack in the "OFF/CHARGE" mode. The power cable is permanently connected to the suction apparatus.

b. Electrical jack. This two-conductor electrical jack is used to provide 12 VDC from an external source for operation of the suction apparatus in the "12V DC" mode.

Section III. OPERATING INSTRUCTIONS

2-5. Initial start-up procedures.

a. Unlatch the case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

b. Ensure that the operating mode selector switch is in the "OFF/CHARGE" position.

c. Connect the power cable to a 115-volt electrical receptacle.

d. Recharge the internal battery pack for approximately 16 hours.

2-6. Routine start-up procedures.

a. Unlatch the case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

b. Determine the location for use of the suction apparatus and the mode of electrical operation as follows:

(1) Field hospital treatment area or ward—AC electrical power.

WARNING

Do not use in the presence of flammable anesthetics to preclude an explosion hazard.

(2) Ambulance or other evacuation vehicle—DC (12 V) electrical power.

(3) Litter—internal battery pack.

c. Ensure that the operating mode selector switch is in the "OFF/CHARGE" position.

d. Connect either the power cable or the vehicle power cord to an appropriate source of electrical power.

NOTE

The "CHARGE" indicator will illuminate when connected to 115 VAC.

e. Verify that all tubing connections are tight and that the black collection canister end caps are firmly in place. No kinks should be in the connecting tubing.

f. Turn the operating mode selector switch to either the "AC," "12V DC," or "BATTERY" position as required.

NOTE

The vacuum pump will start operating and the green "POWER" indicator will illuminate.

g. Pinch and hold the clear, plastic tubing connected to the collection canister and then rotate the "VACUUM ADJUST" control knob to the desired maximum deliverable vacuum level. Release the tubing.

NOTE

Deliverable vacuum will not exceed the preset level.

h. Qualified medical personnel will connect the patient suction tube and a suction catheter to the collection canister and aspirate the patient.

WARNING

Do not block or occlude the exhaust port of the vacuum pump to preclude incorrect operation of the suction apparatus.

CAUTION

Do not operate the suction apparatus with the lid of the case closed unless an optional overflow safety device is used.

Do not use the suction apparatus for more than 27 minutes per hour using AC power.

i. During operation of the suction apparatus, periodically observe the vacuum gauge setting and the collection canister for potential overflow.

2-7. Operating hints.

a. The rinse bottle, holding a water and saline solution, should always be available during patient aspiration to flush out a clogged patient suction tube or suction catheter.

CAUTION

The rinse bottle containing water and saline solution should always be tightly closed when not in use.

b. Multiple collection canisters may be connected, in series, if a large quantity of aspirate is anticipated.

c. A standard hospital style collection canister should be considered for use if the suction apparatus is used on a "crash cart." This will afford greater collection capacity and indicate aspirate volume.

d. Two litter mounting straps with hook-and-loop fasteners will be used in conjunction with the four D-rings (located on the front and back of the case) to mount the suction apparatus to a litter.

2-8. Changing maximum deliverable vacuum level.

Procedures to change the maximum deliverable vacuum level, during use of the suction apparatus on a patient, are as follows:

a. Pinch and hold the clear, plastic tubing connected to the collection canister.

b. Rotate the "VACUUM ADJUST" control knob until the new setting is displayed on the vacuum gauge.

NOTE

Rotating the control knob clockwise increases the level of vacuum and rotating the control knob counterclockwise decreases the vacuum level.

c. Release the pinched tubing and resume aspirating the patient.

WARNING

Rotating the "VACUUM ADJUST" control knob, without pinching the clear, plastic tubing connected to the collection canister, will change the maximum deliverable vacuum level to an unknown setting.

2-9. Mounting the suction apparatus.

Mount the suction apparatus onto a litter by completing the following procedures:

a. Locate the two black webbed nylon straps with hook-and-loop fasteners on each end.

b. Position the suction apparatus and the patient onto the litter.

c. Thread the straps through the D-ring fasteners (fig 2-5) (located near the lower front and back of the case) and secure the suction apparatus.

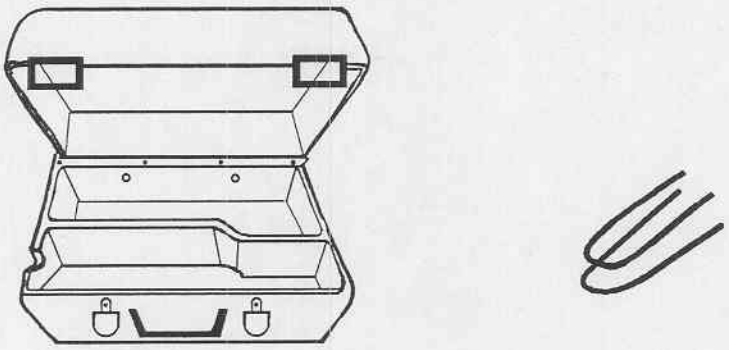

Figure 2-5. D-rings and straps.

2-10. Shut-down procedures.

Shut-down procedures are as follows:

a. Rotate the "VACUUM ADJUST" control knob fully counterclockwise to decrease the level of vacuum to "0."

NOTE

The vacuum gauge will show "0" millimeters/inches of mercury.

b. Turn the operating mode selector switch to the "OFF/CHARGE" position.

NOTE

The "POWER" indicator will extinguish and the "CHARGE" indicator will illuminate (providing that the power cable is connected to a 115-volt receptacle).

c. Disconnect the patient suction tube from the collection canister.

d. Prepare the suction apparatus for either the next procedure or for a nonuse period. Cleaning, disinfecting, and sterilizing procedures are contained in this chapter, section V.

Section IV. OPERATION OF AUXILIARY EQUIPMENT

2-11. Associated support items of equipment.

The suction apparatus requires no associated support items of equipment other than an electrical power generator, which is shared with multiple items of surgical equipment for electrical power, or the use of the ambulance or other evacuation vehicle battery as a source of DC power.

2-12. Associated material.

Associated materiel is identified in appendix D and appendix E.

Section V. CLEANING, DISINFECTING, AND STERILIZING PROCEDURES

2-13. General.

a. The suction apparatus and operating accessories should be clean at all times. Specific cleaning, disinfecting, and/or sterilizing procedures are provided in subsequent paragraphs.

b. Accessories identified as disposable should not be cleaned and reused. These accessories were designed and manufactured for one use only.

c. The collection canister should be removed from the case to facilitate cleaning.

2-14. Suction apparatus.

a. Cleaning.

(1) Turn off the suction apparatus by turning the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord.

(3) Remove the collection canister, rinse bottle, and all other accessories.

(4) Wipe the interior and exterior of the suction apparatus case and control panel using a mild, non-abrasive cleanser with a damp cloth.

WARNING

Do not immerse the suction apparatus in a liquid or allow liquid to leak below the control panel.

(5) Dry the suction apparatus with a soft cloth.

(6) Reinstall the collection canister.

(7) Replace all other accessories into the case.

(8) Prepare the suction apparatus for either the next procedure or for a nonuse period.

b. Disinfecting. Disinfect the suction apparatus by wiping it with a liquid disinfectant or lightly spraying it with disinfectant in accordance with standard unit procedures.

c. Sterilizing. The suction apparatus cannot be sterilized.

2-15. Collection canister.

a. Cleaning.

(1) Disconnect the tubing from both collection canister connectors.

CAUTION

Proceed slowly and carefully to prevent accidentally spilling any patient aspirate.

(2) Connect the 9-inch section of tubing to both collection canister connectors.

(3) Dispose of the aspirate in accordance with standard unit procedures.

(4) Disassemble the collection canister by removing the two end caps.

WARNING

All tubing is disposable and intended for one use.

(5) Clean the collection canister cylinder and end caps in accordance with standard unit procedures.

WARNING

Do not clean the cylinder with abrasive cleansing agents, alcohol, or chlorinated hydrocarbon agents.

(6) Wipe the collection canister cylinder and end caps with a soft cloth.

b. Disinfecting. Disinfect the collection canister with a liquid or spray disinfectant using standard unit procedures.

NOTE

Routine disinfection of the collection canister which does not involve removing aspirate can be accomplished using a spray disinfectant. Follow the routine start-up procedures (para 2-6) and while the vacuum pump is operating, spray a small amount of disinfectant directly into the collection canister.

c. Sterilizing (ethylene oxide (EtO) only). Sterilize the collection canister in accordance with standard unit procedures.

WARNING

Do not steam sterilize (autoclave) the collection canister.

Section VI. OPERATION UNDER UNUSUAL CONDITIONS

2-16. General.

The suction apparatus is a transportable device designed to operate within a field medical treatment facility, within an ambulance or other evacuation vehicle, and with a litter. When it is operated in a wet environment, precautions should be taken to protect the suction apparatus by covering it with a protective barrier (plastic sheet, tarpaulin, etc.).

WARNING

The protective barrier will not interfere with safe operation of the suction apparatus.

2-17. Operating temperature range.

a. The suction apparatus should not be operated when the temperature is not within the range of -60°C to 60°C (-76°F to 140°F).

b. The suction apparatus should not be recharged when the temperature is not within the range of -20°C to 50°C (-4°F to 122°F).

CHAPTER 3

UNIT LEVEL MAINTENANCE

Section I. GENERAL INFORMATION

3-1. Overview.

a. Unit level maintenance. This level of maintenance is the responsibility of and performed by a using unit on its assigned equipment. Responsibilities are stratified as follows:

(1) *Operator maintenance.* This segment of unit level maintenance is performed by operator/user personnel and consists of equipment operational functions; routine services like cleaning, dusting, washing, checking for frayed cables, and stowing items not in use; and checking for loose hardware, replacing operator accessories, and replacing operator repair parts. Replacing operator parts will not require extensive disassembly or assembly of the end item, critical adjustments after replacement, or the extensive use of tools.

(2) *Specialist maintenance.* This segment of unit level maintenance is performed only by trained Medical Equipment Repairers. The functions and services include—

(a) Scheduling and performing PMCS, electrical safety inspections and tests, and calibration/verification/certification (CVC) services.

(b) Performing unscheduled maintenance functions with emphasis on replacing assemblies, modules, and PCBs, when available.

(c) Operating a repair parts program to include Class VIII repair parts as well as other commodity class repair parts used on medical equipment.

(d) Maintaining a library of technical manuals (TMs), manufacturers' literature, repair parts information, and related materials.

(e) Conducting inspections on new or transferred equipment.

(f) Establishing administrative procedures for the control and administration of maintenance services in accordance with TB 38-750-2.

(g) Notifying support maintenance battalions of requirements and/or evacuating unserviceable equipment, assemblies, or modules.

b. Maintenance functions. Maintenance functions, both preventive and corrective, which are beyond the scope of the operator/user are assigned to unit level Maintenance Equipment Repairer personnel. These personnel will perform the majority of maintenance required for the equipment except some tasks involving the vacuum pump and case.

3-2. Tools and test equipment.

Common tools and test equipment required for unit level maintenance of the equipment are listed in appendix B, section III of this manual. Refer to your unit's modified table of organization and equipment (MTOE) for authorized items.

3-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III of this manual.

3-4. Expendable supplies.

Expendable and durable supplies and materials required for maintenance of the equipment are listed in appendix D, section II of this manual.

3-5. Repair parts.

Repair parts required for unit level maintenance are listed in appendix E, section II of this manual.

3-6. Special tools.

Special tools required for unit level maintenance of the equipment are listed in appendix E, section III of this manual.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

3-7. Unpacking the suction apparatus.

a. Open the cardboard shipping carton.

b. Remove the suction apparatus using the handle of the case. Set the case aside.

c. Remove the power transformer by lifting its cardboard packing assembly. Remove the packing assembly and the transformer plastic covering. Set them aside.

d. Remove the two instruction manuals. Set them aside.

NOTE

The suction apparatus may be packed into a military chest and operating components may be within this chest and not within the suction apparatus case.

e. Unlatch the case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

f. Observe how the components and accessories are packed into the case.

g. Verify receipt of the following material:

(1) Vehicle power cord.
(2) Catheter, 14 french.
(3) Catheter, 18 french.
(4) Rinse bottle.
(5) Patient suction tube.
(6) Tubing, 9-inch.
(7) Strap, litter mounting, 2 each.
(8) Collection canister with fittings.
(9) Instruction manuals, 2 each.
(10) Power transformer.
(11) Suction apparatus with case.

3-8. Assembling the suction apparatus.

No assembly or suction apparatus interconnections are required before its operation. You should, however, verify that the black collection canister end caps are tight and that the canister tubing connections are tight.

CAUTION

Accessories not required for a specific patient procedure or overseas voltage configuration should be stored to prevent damage or loss.

NOTE

Do not connect the patient suction tube and suction catheter until they are required for use with the suction apparatus. This will preclude the waste of disposable accessories that are furnished in sterile packaging.

3-9. Charging the battery pack.

The internal battery pack of the suction apparatus will be charged by following the initial start-up procedures contained in paragraph 2-5.

3-10. Preparing the power transformer for use.

a. Remove the four Phillips screws from the bottom corners of the power transformer.

b. Grasp the top section of the transformer case with one hand and the bottom section of the transformer case with your other hand. Then rock each section of the transformer case in opposite directions while pulling the transformer sections apart. Set the transformer on a work surface.

NOTE

The two transformer sections are connected by electrical wires.

c. Obtain a 6-foot length of three conductor electrical cable and a hospital grade male connector suitable for use with 220 to 250 volts.

NOTE

A hospital-grade molded power cable and connector may be used.

d. Remove approximately four inches of the protective sheath on the unterminated end of the electrical cable. Then strip each of the three individual wires to allow approximately one-half inch of bare wire.

e. Scrape the insulating varnish from the three bare wires and then tin the wires.

f. Thread these wires through the power cable mounting hole (fig 3-1) until the protective sheath is approximately 1 inch inside the case.

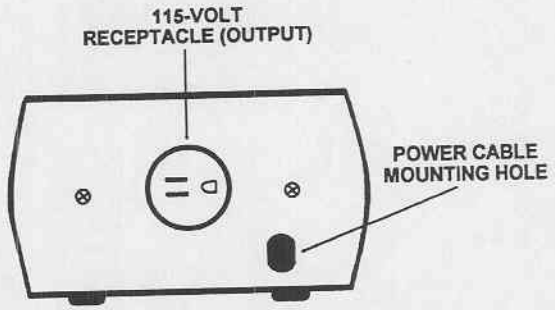

Figure 3-1. Power transformer cable.

g. Install the power cable strain relief grommet around the power cable and push it into the mounting hole until it locks into place.

h. Connect the electrical wires to the internal transformer by following table 3-1.

Table 3-1. Transformer wiring connections.

Pin	*Description*	*115-volt wire color*	*230-volt wire color*
1	115/230 volt	black	refer to local electrical code
2	115-volt neutral	white	N/A
3	230-volt neutral	N/A	refer to local electrical code

i. Crimp the 230-volt ground wire to the electrical ring terminal secured by the transformer mounting hardware.

j. Test the transformer circuits using a multimeter and then connect it to electrical power to ensure 115-volt output.

k. Close the transformer case and set it down on its top.

l. Replace the four Phillips screws and return the transformer to its upright position.

Section III. LUBRICATION INSTRUCTIONS

3-11. General.

No lubrication of the suction apparatus is required.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-12. General.

a. The suction apparatus must be inspected and serviced systematically to ensure that it is ready for operation at all times. Inspection will allow defects to be discovered and corrected before they result in serious damage or failure.

b. Table 3-2 contains a list of items to be performed by unit level operator/user personnel. This PMCS table is also referred to as "-10 PMCS" requirements. Preventive maintenance by operator/user personnel is not limited to performing the checks and services in table 3-2. There are things operator/user personnel should do any time they need to be done, such as checking general cleanliness, observing for improper operational indicators, and maintaining the proper quantities of accessories.

c. Table 3-3 contains a list of items to be performed by unit level Medical Equipment Repairers. This PMCS table is also referred to as "-20 PMCS" requirements.

d. Some items to be inspected will be listed in both table 3-2 and table 3-3 to stress their importance, to provide a quality control check on multiple operator/user personnel, and to identify more comprehensive procedures to be accomplished by unit level Medical Equipment Repairers.

e. The following is a list of both PMCS table column headings with a description of the information found in each column:

(1) *Item No.* This column shows the sequence in which to do the PMCS, and is used to identify the equipment area on the Equipment Inspection and Maintenance Worksheet, DA Form 2404.

(2) *Interval.* This column shows when each PMCS item is to be serviced: **B** - Before Operation, **D** - During Operation, **A** - After Operation, **Q** - Quarterly, and **S** - Semiannually. **B, D,** and **A** should be performed with daily use of the equipment.

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NOTE

When the suction apparatus must be kept in continuous operation, check and service only those items that will not disrupt operation. Perform the complete daily checks and services when the equipment can be shut down.

(3) *Item to be Inspected and Procedure.* This column identifies the general area or specific part to be checked or serviced.

(4) *Equipment is not Ready/Available If:.* This column lists conditions that make the equipment unavailable or unusable.

Table 3-2. Operator preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1	X		X		X	**Suction apparatus.**	
						a. Ensure that all components and accessories are on hand.	Missing components and accessories prevent operation of the suction apparatus.
						b. Check for a broken, damaged, or inoperable mode selector switch, "VACUUM ADJUST" control, indicators, or circuit breaker.	Broken or damaged components prevent operation of the suction apparatus.
						c. Ensure that the collection canister and tubing are not discolored, cracked, or crimped.	Unserviceable components or accessories prevent operation of the suction apparatus.
						NOTE The patient suction tube and catheters will be used only one time.	
						d. Ensure that the collection canister end caps are tight.	The condition of the end caps limits the maximum deliverable vacuum level.
						e. Check for a broken or inoperable vacuum gauge.	The condition of the vacuum gauge prevents accurate determination of vacuum level.

NOTE

The PMCS interval should be changed from semiannually to quarterly during long periods of sustained use.

Table 3-2. Operator preventive maintenance checks and services - continued.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
						f. Inspect the power cable and the vehicle power cord for cuts, deterioration, fraying, or other physical damage.	The condition of the power cable or vehicle power cord prevents operation or causes a safety hazard.
						g. Check the suction apparatus for correct operation by following the procedures in paragraph 3-15.	The suction apparatus does not operate with the specified procedures.
2	X		X		X	**Case.**	
						a. Inspect for cracks, dents, or puncture holes.	Case damage prevents protective storage, safe movement, or safe use.
						b. Check for loose, bent, or broken latches.	Unserviceable latches prevent safe movement.
						c. Ensure that four D-ring fasteners are attached to the case.	Missing D-ring latches prevent operation using a litter.

Table 3-3. Repairer preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1				X		**Suction apparatus.**	
						a. Verify that components and accessories have been inventoried by operator/user personnel.	Missing components and accessories prevent operation of the suction apparatus.
						b. Check for a broken, damaged, or inoperable mode selector switch, "VACUUM ADJUST" control, indicators, or circuit breaker.	Broken, damaged, or inoperable components prevent operation of the suction apparatus.
						c. Inspect the power cable and the vehicle power cord for cuts, fraying, deterioration, and worn or damaged connectors.	Worn, damaged, or deteriorated power assemblies prevent safe operation of the suction apparatus.
						d. Verify that the electrical safety tests have been completed as scheduled.	Safety deficiencies preclude safe operation.

Table 3-3. Repairer preventive maintenance checks and services - continued.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
						e. Remove dust and debris from the electronic chassis by using air pressure in the range of 9 to 15 psi. Use a small brush to help dislodge dust and/or debris.	Damaged, corroded, overheated components cause unsafe operation or prevent continued operation.
						f. Verify that the vacuum and airflow levels meet the specifications.	Vacuum and airflow levels are diminished to preclude the full range of patient treatment procedures.
						g. Perform the operational test specified in paragraph 3-16.	The test indicates a specific mode or overall malfunction.
						h. Check the vacuum gauge for a "0" indication when the suction apparatus is off.	The vacuum gauge indicates a incorrect value greater than ±3 percent.
						i. Verify operation of the suction apparatus in "12V DC" mode.	The suction apparatus is inoperable.
2					X	**Case.**	
						a. Inspect the case for structural integrity.	Case damage or wear precludes protective storage, safe movement, or safe use.
						b. Check for broken or missing latches.	Unserviceable latches prevent safe movement.

3-13. Reporting deficiencies.

Operator personnel will report problems with the suction apparatus discovered during their "-10 PMCS" that they are unable to correct. Refer to TB 38-750-2 and report the deficiency using the proper forms. Consult with your unit Medical Equipment Repairer if you need assistance.

Section V. OPERATIONAL TESTING

3-14. General.

This section contains procedures for operational testing of the suction apparatus by both operator/user personnel and Medical Equipment Repairer personnel. Deficiencies identified by operator/user personnel should be reported to Medical Equipment Repairer personnel.

3-15. Operator/user tests.

a. Operating mode selector switch (fig 3-2).

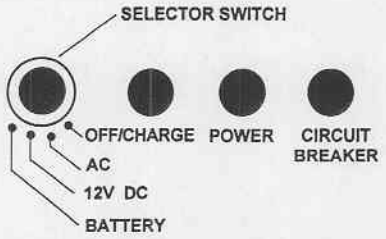

Figure 3-2. Operating mode selector switch.

(1) Unlatch the suction apparatus case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

(2) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(3) Connect the power cable to a 115-volt receptacle. Observe that the green "CHARGE" indicator is illuminated.

(4) Rotate the operating mode selector switch to the "AC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(5) Rotate the operating mode selector switch to the "12V DC" position.

NOTE

The suction apparatus will not operate in the "12V DC" position during this test.

(6) Rotate the operating mode selector switch to the "BATTERY" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(7) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

b. "VACUUM ADJUST" control (fig 3-3).

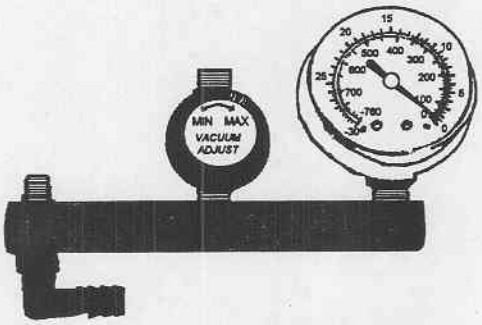

Figure 3-3. Vacuum adjust control.

(1) Rotate the operating mode selector switch to the "AC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(2) Pinch and hold the clear plastic tubing connected to the collection canister. Then rotate the "VACUUM ADJUST" control knob fully counterclockwise and then fully clockwise. Observe that the vacuum gauge needle indicator gradually increases from "0" to at least 560 mm Hg (22 in Hg).

NOTE

Failure of the vacuum to reach the specified level may indicate a vacuum leak or a defective vacuum pump. Notify your Medical Equipment Repairer personnel.

(3) Release the tubing.

(4) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

3-16. Medical Equipment Repairer tests.

a. Operating mode selector switch (fig 3-4).

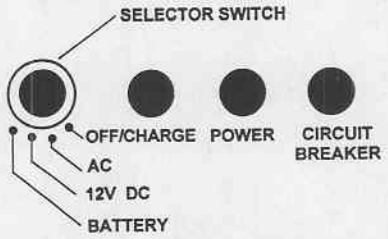

Figure 3-4. Operating mode selector switch.

(1) Unlatch the suction apparatus case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

(2) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(3) Connect the power cable to a 115-volt receptacle. Observe that the green "CHARGE" indicator is illuminated.

(4) Rotate the operating mode selector switch to the "AC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(5) Rotate the operating mode selector switch to the "BATTERY" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(6) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

(7) Disconnect the power cable from the 115-volt receptacle.

(8) Locate a 12 VDC source of electrical power and connect the vehicle power cord from it to the electrical jack on the side of the suction apparatus. Observe that the "CHARGE" indicator does not illuminate.

(9) Rotate the operating mode selector switch to the "12V DC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(10) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

(11) Disconnect and store the vehicle power cord.

(12) Reconnect the power cable to a 115-volt receptacle.

b. "VACUUM ADJUST" control.

(1) Rotate the operating mode selector switch to the "AC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(2) Connect a test vacuum gauge (refer to appendix B, section III) to the "patient side" of the collection canister.

WARNING

The test vacuum gauge must be connected after the vacuum pump is operating. Otherwise, the occluded vacuum inlet can result in a startup motor torque requirement that is in excess of the vacuum pump motor capacity. The motor will then stall, temporarily draw excessive current, overheat, and trip the circuit breaker.

(3) Ensure that the black collection canister end caps and all tubing connections are tight. Ensure that all tubing is free of kinks.

(4) Rotate the "VACUUM ADJUST" control knob fully counterclockwise and then fully clockwise. Observe and verify that the suction apparatus vacuum gauge and the test vacuum gauge indicate at least 560 mm Hg (22 in Hg).

NOTE

If a variation occurs, record both vacuum gauge readings. Then, calculate a deviation of ±3 percent and determine the final reading.

(5) Rotate the "VACUUM ADJUST" control knob counterclockwise slowly and observe and verify the reading of both gauges at 380, 260, and 130 mm Hg (15, 10, and 5 in Hg).

NOTE

If variations occur, record both vacuum gauge readings at each of the four settings. Then calculate a deviation of ±3 percent and determine the final readings for linearity of the suction apparatus vacuum gauge.

(6) Disconnect the test vacuum gauge.

(7) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

c. Patient circuit airflow.

(1) Unlatch the suction apparatus case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

(2) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(3) Connect the power cable to a 115-volt receptacle. Observe that the green "CHARGE" indicator is illuminated.

(4) Ensure that the black collection canister end caps and all tubing connections are tight. Ensure that all tubing is free of kinks.

(5) Connect a test flowmeter (refer to appendix B, section III) to the "patient side" of the collection canister.

NOTE

All connecting tubing used with the flowmeter will have an inner diameter of at least 1/4 inch. The connecting tubing length will be kept to a minimum.

(6) Rotate the operating mode selector switch to the "AC" position. Observe that the vacuum pump operates, the vacuum gauge needle indicator oscillates, and the green "POWER" indicator is illuminated.

(7) Rotate the "VACUUM ADJUST" control knob fully clockwise for maximum free airflow.

(8) Ensure that the flowmeter intake port and the vacuum pump exhaust port are free of obstructions.

(9) Observe the flowmeter and verify a minimum free airflow of 31 LPM.

NOTE

Allow for the tolerance of the flowmeter when verifying the free airflow.

(10) Rotate the operating mode selector switch to the "BATTERY" position.

(11) Observe the flowmeter and verify a minimum free airflow of 31 LPM.

(12) Disconnect the flowmeter.

(13) Rotate the operating mode selector switch back to the "OFF/CHARGE" position.

Section VI. BATTERY PACK CARE AND RECHARGING

3-17. Type of battery.

The suction apparatus uses two lead-acid batteries that are physically connected into a battery pack. The batteries provide excellent charge retention characteristics, particularly during long periods of nonuse. The battery pack is not designed for use as the primary power source.

3-18. Battery pack care and recharging.

a. The life of the suction apparatus battery pack depends, to a great extent, on its care. The self-discharge rate is approximately 1.5 percent per month. Therefore, the suction apparatus can be safely stored for many months. However, the battery capacity should not be allowed to fall below 80 percent.

NOTE

Continuous battery pack recharging is permissible, but not required.

b. Recharge the suction apparatus battery pack as follows:

(1) Unlatch the case by pulling the two black plastic latches forward. Then, lift the lid of the case upward on its hinges until fully open.

(2) Ensure that the operating mode selector switch is in the "OFF/CHARGE" position.

(3) Connect the power cable to a 115-volt electrical receptacle. Observe that the "CHARGE" indicator is illuminated.

NOTE

The battery pack requires approximately 16 hours to fully recharge.

c. Recharge intervals for a suction apparatus battery pack in prolonged storage are identified in table 1-2.

WARNING

Do not recharge the battery pack when the temperature range exceeds -20°C (-4°F) to 50°C (122°F).

Section VII. TROUBLESHOOTING

3-19. General.

a. Troubleshooting information for suction apparatus operator/user personnel and for Medical Equipment Repairer personnel is provided in this section. Corrective actions beyond the capability or authority of operator/user personnel will be indicated by the phrase "No operator/user corrective maintenance is possible."

b. This manual cannot list all possible malfunctions. If a malfunction is either not listed or is not determined by routine diagnostic procedures, notify your appropriate maintenance support unit.

3-20. Operator/user troubleshooting.

Operator/user troubleshooting procedures are provided in table 3-4. Each symptom is followed by possible causes and corrective actions.

Table 3-4. Operator/user troubleshooting.

SYMPTOM POSSIBLE CAUSE CORRECTIVE MAINTENANCE
1. "CHARGE" INDICATOR DOES NOT ILLUMINATE.
Operating mode selector switch in "AC," "12V DC," or "BATTERY" position.
Rotate switch counterclockwise to the "OFF/CHARGE" position.
Faulty 115-volt receptacle.
Use another 115-volt receptacle, if available. Otherwise, no operator/user corrective maintenance is possible.
Circuit breaker activated.
Push down on circuit breaker to reset it.
WARNING If the circuit breaker is activated again, discontinue operation and notify your unit Medical Equipment Repairer.
Internal electrical problem.
No operator/user corrective maintenance is possible.
2. VACUUM PUMP INOPERATIVE (CONNECTED TO 115-VOLT POWER).
Operating mode selector switch in "OFF/CHARGE," "12V DC," or "BATTERY" position.
Rotate switch to "AC" position.
Faulty 115-volt receptacle.
Use another 115-volt receptacle, if available. Otherwise, no operator/user corrective maintenance is possible.
Circuit breaker activated.
Push down on circuit breaker to reset it.
WARNING If the circuit breaker is activated again, discontinue operation and notify your unit Medical Equipment Repairer.
Internal electrical problem.
No operator/user corrective maintenance is possible.
3. VACUUM PUMP INOPERATIVE (CONNECTED TO EXTERNAL 12 VDC).
Operating mode selector switch in "OFF/CHARGE" or "AC" position.
Rotate switch to "12V DC" position.
Defective vehicle power cord.
No operator/user corrective maintenance is possible.
Internal electrical problem.
No operator/user corrective maintenance is possible.

Table 3-4. Operator/user troubleshooting - continued.

SYMPTOM POSSIBLE CAUSE CORRECTIVE MAINTENANCE
4. VACUUM PUMP INOPERABLE (USING INTERNAL BATTERY PACK).
Operating mode selector switch in "OFF/CHARGE," "AC," or "12V DC" position.
Rotate switch to "BATTERY" position.
Battery pack fully discharged.
Recharge battery pack.
Internal electrical problem.
No operator/user corrective maintenance is possible.
5. INADEQUATE LEVEL OF SUCTION.
Leaking tubing connections or kinked tubing.
Tighten connections or replace tubing.
Clogged tubing or catheter.
Use rinse bottle to flush out aspirated material.
Unknown.
Notify your unit Medical Equipment Repairer.
6. SUCTION APPARATUS CAUSES EMI OR RFI INTERFERENCE.
Internal electrical/electronic problem.
No operator/user corrective maintenance is possible. Replace the suction apparatus or request emergency repair services.

3-21. Medical Equipment Repairer troubleshooting.

Medical Equipment Repairer troubleshooting procedures are provided in table 3-5. Each symptom is followed by possible causes and corrective actions.

Table 3-5. Medical Equipment Repairer troubleshooting.

SYMPTOM POSSIBLE CAUSE CORRECTIVE ACTION
1. "CHARGE" INDICATOR DOES NOT ILLUMINATE.
Faulty 115-volt receptacle.
Notify appropriate power distribution personnel or correct the problem in an ISO shelter.
Defective power cable.
Replace the defective connector or the entire power cable.
Operating mode selector switch in "AC," "12V DC," or "BATTERY" position.
Rotate switch counterclockwise to the "OFF/CHARGE" position.
Unserviceable battery pack.
Replace one of both batteries.

Table 3-5. Medical Equipment Repairer troubleshooting - continued.

SYMPTOM POSSIBLE CAUSE	CORRECTIVE ACTION
Defective lamp in "CHARGE" indicator.	Replace lamp.
Unserviceable operating mode selector switch.	Replace switch.
Defective fuse.	Replace fuse.
2. VACUUM PUMP INOPERABLE (CONNECTED TO 115-VOLT POWER).	
Faulty 115-volt receptacle.	Notify appropriate power distribution personnel or correct the problem in an ISO shelter.
Unserviceable power cable.	Replace the defective connector or the entire power cable.
Circuit breaker activated.	Reset circuit by pushing it down. **WARNING** If the circuit breaker is activated again, discontinue operation and determine the cause of the excessive current flow.
Operating mode selector switch in "OFF/CHARGE" or "12V DC" position.	Rotate switch to "AC" position.
Unserviceable operating mode selector switch.	Replace switch.
Defective EMI filter.	Replace defective components.
Unserviceable vacuum pump/motor.	Repair and/or replace vacuum pump/motor.
3. VACUUM PUMP INOPERABLE (CONNECTED TO EXTERNAL 12 VDC POWER).	
Unserviceable vehicle power cord.	Repair or replace cord.
Faulty source of 12 VDC power.	Notify the appropriate vehicle repair personnel.
Circuit breaker activated.	Push the circuit breaker down to reset it. **WARNING** If the circuit breaker is activated again, discontinue operation and notify your unit Medical Equipment Repairer.
Operating mode selector switch in "OFF/CHARGE" or "AC" position.	Rotate switch to "12V DC" position.

Table 3-5. Medical Equipment Repairer troubleshooting - continued.

SYMPTOM POSSIBLE CAUSE CORRECTIVE ACTION
Unserviceable operating mode selector switch.
Replace switch.
Defective vacuum pump/motor.
Repair and/or replace vacuum pump/motor.
4. VACUUM PUMP INOPERABLE (USING INTERNAL BATTERY PACK).
Operating mode selector switch in "OFF/CHARGE," "AC," or "12V DC" position.
Rotate switch to "BATTERY" position.
Battery pack fully discharged.
Recharge battery pack.
Unserviceable battery pack.
Replace one or both batteries.
Battery charger circuit defective.
Repair open or shorted wiring and replace defective components as required.
Defective fuse.
Replace fuse.
5. INADEQUATE LEVEL OF SUCTION.
Leaking tubing connections or kinked tubing.
Tighten connections or replace tubing.
Clogged tubing or catheter.
Use rinse bottle to flush out aspirated material.
Unserviceable collection canister end caps.
Reseal or replace end caps.
Incorrect "VACUUM ADJUST" control setting.
Turn the "VACUUM ADJUST" control knob further in a clockwise direction.
Foreign matter in vacuum pump head assembly.
Disassemble and repair vacuum pump head assembly.

Section VIII. CIRCUIT DESCRIPTIONS

3-22. General.

a. The schematic diagram for the suction apparatus is provided in figure 3-5 to assist you when troubleshooting. Isolate the problem to a functional segment of the circuitry.

b. Circuit descriptions are provided for the functional segments as well as individual component identification.

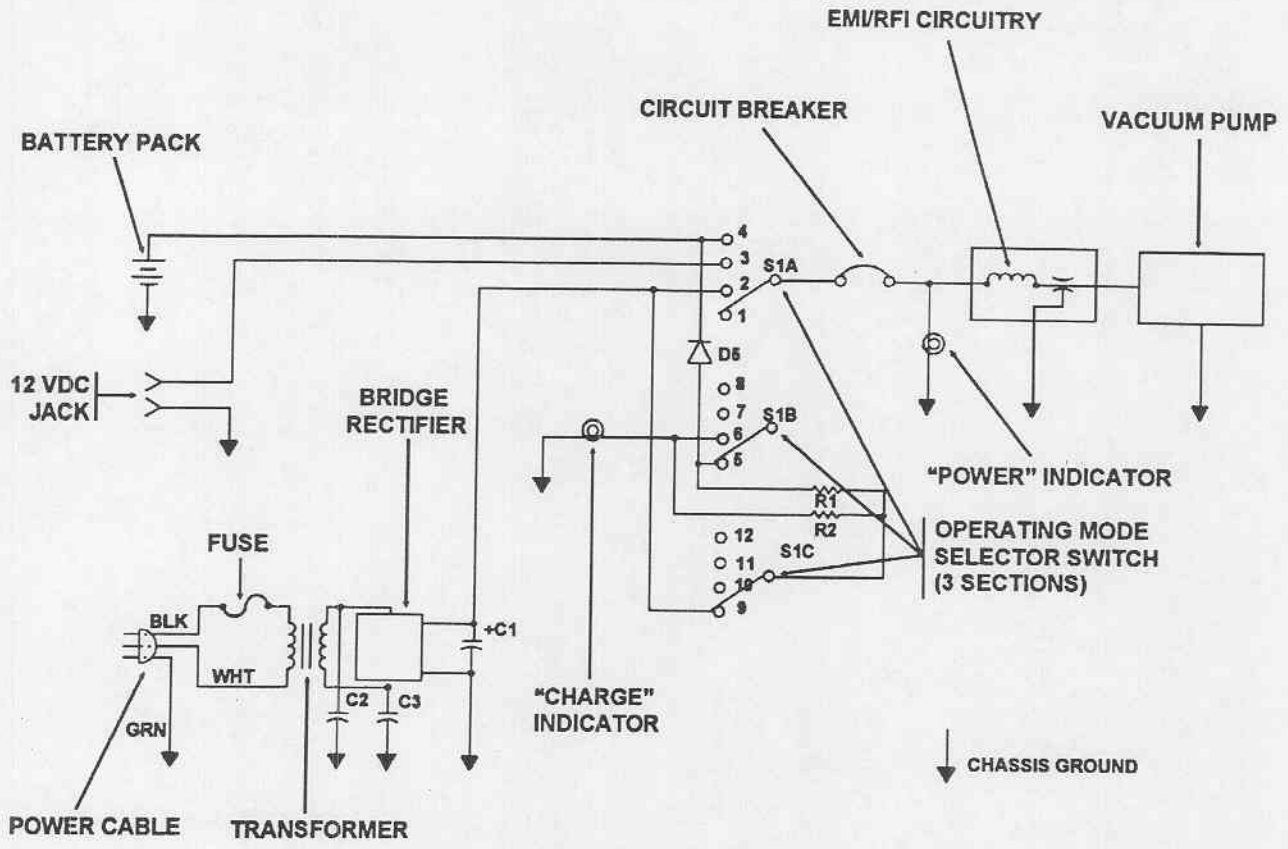

Figure 3-5. Schematic diagram.

3-23. Power supply (AC) circuit.

a. The AC power supply consists of the power cable, fuse, transformer, bridge rectifier, three filter capacitors, and associated wiring.

b. The transformer reduces the source 115-VAC power to approximately 19 VAC p-p. The bridge rectifier and three filter capacitors convert the AC power to approximately +15 VDC with a 2.8 VAC ripple.

NOTE

The DC voltage output is transferred to the vacuum pump/motor or battery charger through the operating mode selector switch.

3-24. Power supply (battery pack) circuit.

The battery pack power supply consists of the battery pack and associated wiring.

NOTE

The internal power supply is transferred to the vacuum pump/motor through the operating mode selector switch.

3-25. Battery charger circuit.

a. The battery charger consists of a diode, two resistors, and the charge indicator.

b. One resistor limits the battery charging current to a range of 15 to 40 milliamperes and the second resistor limits the charge indicator current to approximately 70 milliamperes. The diode simply prevents the charge indicator from illuminating during internal battery pack operation. The charge indicator illuminates when battery pack charging occurs.

NOTE

The battery charger circuitry is connected to the battery pack through the operating mode selector switch.

3-26. Vacuum pump/motor circuit.

a. The vacuum pump/motor circuit consists of the circuit breaker, charge indicator, and the motor.

b. The circuit breaker protects the vacuum pump/motor from excessive current and the power indicator illuminates when power is supplied to the vacuum pump motor.

NOTE

The vacuum pump/motor circuit is connected to the three sources of DC power through the operating mode selector switch.

3-27. EMI/RFI circuit.

The EMI/RFI filter module is a low-pass filter connected between the circuit breaker and the vacuum pump/motor to suppress interference generated by the motor.

Section IX. REPAIR PROCEDURES

3-28. General.

a. Procedures for disassembly, repair or replacement of components, services, and reassembly are provided in this section of the manual.

b. Repair procedures are continuous from the first disassembly step to the final reassembly step.

WARNING

Hazardous voltages are accessible beneath the control panel when it is removed for testing and/or repairs.

3-29. Vacuum pump head.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge. Refer to figure 3-6.

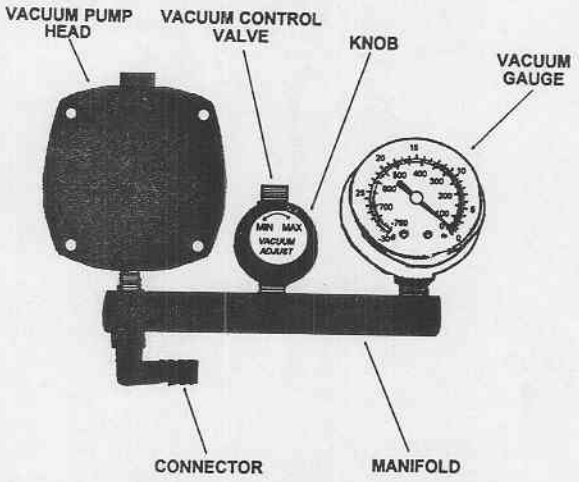

Figure 3-6. Vacuum pump head and manifold (front).

(6) Place the vacuum pump head and manifold upside down on a work surface padded with a soft cloth to prevent damage to the "VACUUM ADJUST" knob or the vacuum gauge (fig 3-7).

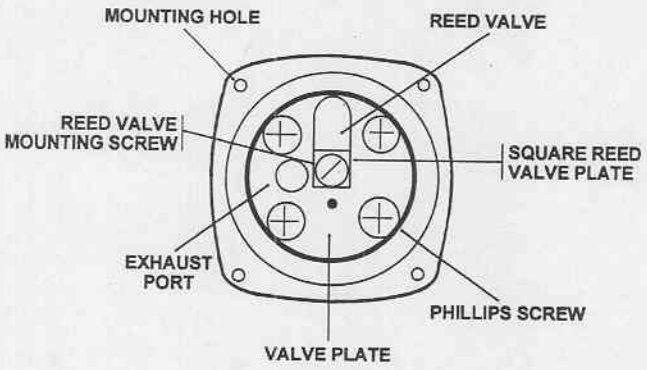

Figure 3-7. Pump head.

(7) Remove the four Phillips screws from the round valve plate.

(8) Lift the vacuum pump head and manifold with your fingers while holding the round valve plate in place. Then, while holding the vacuum pump head, shake it gently to determine that the round valve plate is free.

(a) If the round valve plate is free, turn the vacuum pump head and manifold over and drop the round valve plate into your hand. Set them both down.

NOTE

The rubber gasket may be stuck either to the round valve plate or the vacuum pump head housing, or fall free.

(b) If the round valve plate is stuck in place, remove the slotted screw, square reed valve mounting plate, and the reed valve. Then, reinsert the slotted screw and tighten it which will loosen the stuck round valve plate. Remove the slotted screw and set it aside with the square reed valve mounting plate and reed valve.

(9) Turn the vacuum pump head and manifold over and drop the round valve plate and rubber gasket into your hand. Set the vacuum pump head and manifold aside.

(10) Remove the slotted screw, square reed valve mounting plate, and the reed valve from both sides of the valve plate. Set them aside.

NOTE

The upper slotted screw, square reed valve mounting plate, and reed valve may have been removed in a previous procedure if the valve plate was stuck in the vacuum pump head.

The vacuum pump head is now completely disassembled for cleaning and/or repair.

b. Maintenance services.

(1) Examine the gasket for cracking, physical deformity, tears, or deterioration. Replace, if necessary.

(2) Inspect the reed valves for any wear or distortion. Replace if necessary or when the suction apparatus does not meet operation testing requirements. (Refer to para 3-16.)

c. Reassembly.

(1) Reinstall the reed valve onto the underside of the valve plate using the square reed valve mounting plate and a slotted screw.

WARNING

The reed plate must be carefully positioned to cover the port in the valve plate.

The square reed valve mounting plate must be installed with the lettering "UP" facing upward to apply the correct pressure to the reed valve.

(2) Reinstall the reed valve onto the upper side of the valve plate using the square reed valve mounting plate and a slotted screw.

WARNING

The reed plate must be carefully positioned to cover the port in the valve plate.

The square reed valve mounting plate must be installed with the lettering "UP" facing upward to apply the correct pressure to the reed valve.

NOTE

The reed valve mounting screw for the upper side of the valve plate is located in the center of the valve plate.

(3) Reinstall the gasket into the vacuum pump head housing by aligning it with the construction of the housing.

WARNING

Incorrect orientation of the gasket will interfere with the operation of the vacuum pump.

(4) Reinstall the valve plate into the vacuum pump head by orienting it with figure 3-7.

(5) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(6) Reconnect the collection canister to the manifold tubing connector.

(7) Return the rinse bottle and other accessories to the storage compartment of the case.

(8) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

CAUTION

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-30. Vacuum control valve or gauge (fig 3-8).

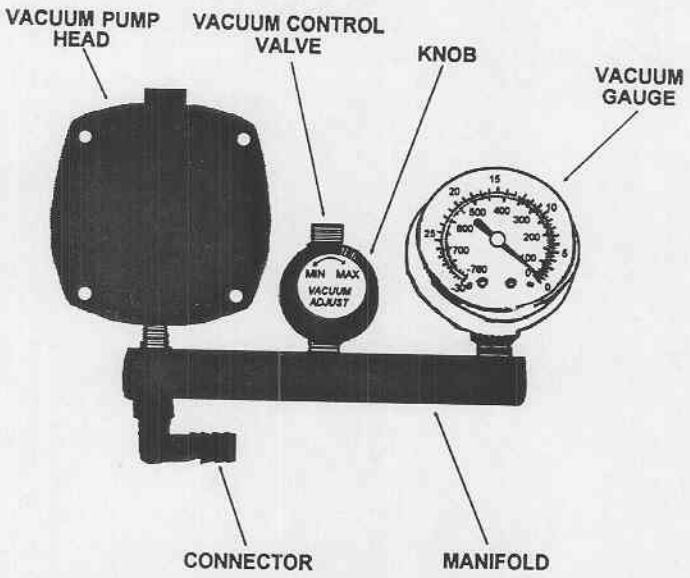

Figure 3-8. Vacuum pump head and manifold (front).

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

(6) Place the manifold into a vise which has smooth or padded jaws to prevent marring the manifold.

CAUTION

Secure the manifold in the vise with minimal holding force.

(7) Use an appropriately sized fixed or adjustable wrench to remove the vacuum pump head, the vacuum gauge, and then the vacuum control valve. Set the component(s) aside.

b. Maintenance services. Repair of either the vacuum control valve or the vacuum gauge is not economically feasible.

c. Reassembly.

(1) Place the vacuum pump head into a vise.

(2) Install a replacement vacuum control valve and/or a replacement vacuum gauge. Remove the vacuum pump head from the vise.

CAUTION

The vacuum control valve and the vacuum gauge fittings have tapered threads to achieve airtight seals using high torque pressure. Do not tighten excessively to prevent breaking the fittings.

(3) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(4) Reconnect the collection canister to the manifold tubing connector.

(5) Return the rinse bottle and other accessories to the storage compartment of the case.

(6) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-31. Battery pack.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

NOTE

Multiple electrical wires interconnect between the underside of the control panel and the components in the lower section of the case.

(8) Remove the two Keps nuts fastening the battery pack bracket to the chassis using a 3/8-inch extension socket wrench. Set them aside.

(9) Remove the battery pack bracket. Set it aside.

(10) Reposition the battery pack to an upright position within the case (terminals upward).

CAUTION

Reposition the battery pack carefully to prevent inadvertently breaking electrical wires from their terminals.

(11) Verify that terminal connecting wire colors and battery pack terminal markings match the illustration in figure 3-9.

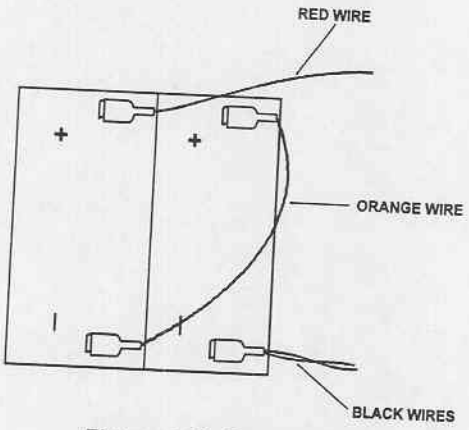

Figure 3-9. Battery pack.

(12) Pull the red and black wire female spade terminals from the battery pack terminals.

NOTE

The orange wire female spade terminals should remain connected to the battery pack.

(13) Remove the battery pack.

b. Maintenance services.

(1) Acquire either one or both batteries, if necessary.

(2) Position and band the batteries together by following figure 3-9 and transfer the orange wire jumper to the replacement battery pack.

c. Reassembly.

(1) Place the battery pack into the lower section of the case with the battery pack terminals and colored wire terminals matching figure 3-9.

(2) Reconnect the red and black wire female spade terminals.

(3) Verify the correct battery pack orientation and terminal connections.

(4) Reposition the battery pack onto its side with the terminals facing outward to the side of the lower section of the case.

(5) Reinstall the battery pack bracket onto the two projecting screws.

(6) Reinstall the two Keps nuts.

(7) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(8) Reinstall the eight Phillips screws around the periphery of the control panel.

(9) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(10) Reconnect the collection canister to the manifold tubing connector.

(11) Return the rinse bottle and other accessories to the storage compartment of the case.

(12) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-32. Power cable.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

(8) Depress the lip of the plastic power cable holder to open it. Remove the power cable harness.

(9) Remove the cable ties using your cutting pliers.

(10) Remove the shrink tubing from the black and white power cable wires.

(11) Observe and record the wire color connections.

(12) Unsolder the black and white power cable wires at their splice points.

CAUTION

The correct wire color mating is critical to ensure that the 115-volt wire (black) is fused to prevent a hazardous condition.

(13) Remove the Keps nut fastening the green ground wire to the vacuum pump/motor chassis using a 3/8-inch extension socket wrench. Set the nut aside.

(14) Remove the green ground wire ring terminal from the upward projecting screw.

(15) Grip the strain relief grommet latch with your pliers and apply inward pressure to the grommet while simultaneously pushing the grommet upward out of the power cable mounting hole.

(16) Pull the power cable wires through the mounting hole.

(17) Remove the clear plastic grommet washer. Set it aside.

(18) Remove the strain relief grommet. Set it aside.

b. Maintenance services.

(1) Acquire a replacement power cable and prepare it for installation, if necessary.

(2) Inspect the strain relief grommet and grommet washer for serviceability and sizing for the replacement power cable. Acquire a replacement grommet and/or washer, as required.

c. Reassembly.

(1) Thread the power cable through the power cable mounting hole and then through the grommet washer ensuring sufficient wire lengths for reconnection.

(2) Install the strain relief grommet onto the power cable. Then, grip its latch with your pliers and apply inward pressure while simultaneously inserting the grommet into the power cable mounting hole until it latches.

(3) Reinstall the green ground wire terminal onto the vacuum pump/motor chassis mounting screw and secure it with the Keps nut using a 3/8-inch extension socket wrench.

(4) Insert a 2-inch section of shrink tubing onto the black and white power cable wires.

(5) Mechanically twist the black and white power cable wires to their mating connections.

(6) Verify that the black and white power cable wires are correctly connected as recorded during the disassembly procedures.

(7) Solder the wires together.

(8) Slide the shrink tubing over the wire splices and heat the tubing to shrink it in place.

(9) Install four or five cable ties.

(10) Place the power cable wire harness into the plastic power cable holder. Then, depress the holder to latch it.

(11) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(12) Reinstall the eight Phillips screws around the periphery of the control panel.

(13) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(14) Reconnect the collection canister to the manifold tubing connector.

(15) Return the rinse bottle and other accessories to the storage compartment of the case.

(16) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-33. Operating mode selector switch.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it. Set it aside.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

(8) Draw a diagram of all operating mode selector switch terminals to include the colors of all connecting wires, the values and orientations of resistors, and the orientation of the diode.

(9) Unsolder the following wires from the operating mode selector switch:

(a) Blue wire.

(b) Violet wire.

(c) Yellow wire.

(d) Red wiring.

(e) Gray wire.

(10) Unsolder the two resistors. Set them aside.

(11) Unsolder the diode. Set it aside.

(12) Turn the control panel back over and rest it on the lower case.

(13) Remove the operating mode selector switch knob using an Allen wrench to remove the set screw. Set them aside.

(14) Remove the switch mounting nut using either a fixed or adjustable wrench. Set it and its washer aside.

(15) Remove the switch and dispose of it.

b. Maintenance services.

(1) Acquire a replacement switch and prepare it for installation, as required.

(2) Inspect the resistors and diode for reuse. Acquire replacement, if necessary.

c. Reassembly.

(1) Position the replacement operating mode selector switch into its mounting hole and then reinstall the washer and mounting nut using either a fixed or adjustable wrench.

(2) Reinstall the knob and set screw using the Allen wrench to tighten the set screw onto the switch shaft.

CAUTION

Ensure that the operating mode selector switch knob is correctly oriented so that the white marker on the knob corresponds to the switch positions on the control panel.

(3) Solder the diode to the switch terminals by following the diagram in the disassembly procedures.

(4) Solder the two resistors to the switch terminals.

CAUTION

Ensure that the shrink tubing is on the diode and resistor leads to prevent accidental contact with other electrical components or switch terminals.

(5) Solder the following wires by following the diagram in the disassembly procedures:

(a) Gray wire.

(b) Red wire.

(c) Yellow wire.

(d) Violet wire.

(e) Blue wire.

(6) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(7) Reinstall the eight Phillips screws around the periphery of the control panel.

(8) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(9) Reconnect the collection canister to the manifold tubing connector.

(10) Return the rinse bottle and other accessories to the storage compartment of the case.

(11) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-34. "CHARGE" indicator.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

(8) Unsolder the gray wire from one terminal and the black wire from the second terminal of the "CHARGE" indicator on the underside of the control panel.

(9) Remove the black "CHARGE" indicator lens cover from the top side of the control panel by twisting it counterclockwise. Set it aside.

(10) Remove the nut and washer fastening the "CHARGE" indicator body to the top of the control panel using either a fixed or adjustable wrench.

(11) Pull the "CHARGE" indicator body out of its mounting hole from the underside of the control panel.

b. Maintenance services. Acquire a replacement indicator. No other services are required.

c. Reassembly.

(1) Remove the black "CHARGE" indicators lens cover from the replacement indicator. Set it aside. Then, push the indicator body into its mounting hole from the underside of the control panel.

(2) Replace the nut and washer from the top side of the control panel to fasten the "CHARGE" indicator.

NOTE

The height of the upward projection of the indicator is adjustable using the lower mounting nut in conjunction with the nut and washer of the top side of the control panel.

(3) Reinstall the black indicator lens cover from the top side of the control panel.

(4) Solder the gray wire and the black wire back onto the terminals of the "CHARGE" indicator from the underside of the control panel.

(5) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(6) Reinstall the eight Phillips screws around the periphery of the control panel.

(7) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(8) Reconnect the collection canister to the manifold tubing connector.

(9) Return the rinse bottle and other accessories to the storage compartment of the case.

(10) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-35. "POWER" indicator.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

(8) Unsolder the gray wire from one terminal and the black wire from the second terminal of the "POWER" indicator on the underside of the control panel.

(9) Remove the black "POWER" indicator lens cover from the top side of the control panel by twisting it counterclockwise. Set it aside.

(10) Remove the nut and washer fastening the "POWER" indicator body to the top of the control panel using either a fixed or adjustable wrench.

(11) Pull the "POWER" indicator body out of its mounting hole from the underside of the control panel.

b. Maintenance services. Acquire a replacement indicator. No other services are required.

c. Reassembly.

(1) Remove the black "POWER" indicator lens cover from the replacement indicator. Set it aside. Then, push the indicator body into its mounting hole from the underside of the control panel.

(2) Replace the nut and washer from the top side of the control panel to refasten the "POWER" indicator.

NOTE

The height of the upward projection of the indicator is adjustable using the lower mounting nut in combination with the nut and washer on the top side of the control panel.

(3) Reinstall the black indicator lens cover from the top side of the control panel.

(4) Solder the gray wire and the black wire back onto the terminals of the "POWER" indicator from the underside of the control panel.

(5) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(6) Reinstall the eight Phillips screws around the periphery of the control panel.

(7) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(8) Reconnect the collection canister to the manifold tubing connector.

(9) Return the rinse bottle and other accessories to the storage compartment of the case.

(10) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-36. Circuit breaker.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

(8) Draw a diagram of the circuit breaker indicating the wire colors and terminals.

(9) Unsolder the three wires from the circuit breaker terminals.

(10) Twist the circular retaining ring of the circuit breaker from the top side of the control panel while holding the oblong circuit breaker body from the underside of the control panel. Set it aside.

NOTE

Use small needle nose pliers to grasp the indents in the circular ring fastening the circuit breaker. The ring is marked "PUSH" "RESET"in white lettering.

(11) Pull the circuit breaker out of its mounting hole from the underside of the control panel.

b. Maintenance services. Acquire a replacement circuit breaker. No other services are required.

c. Reassembly.

(1) Insert the replacement circuit breaker into its mounting hole from the underside of the control panel.

(2) Reinstall the circular retaining ring onto the circuit breaker using small needle nose pliers from the top of the control panel.

(3) Solder the three wires back onto the circuit breaker terminals in accordance with the diagram prepared in the disassembly procedures.

(4) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(5) Reinstall the eight Phillips screws around the periphery of the control panel.

(6) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(7) Reconnect the collection canister to the manifold tubing connector.

(8) Return the rinse bottle and other accessories to the storage compartment of the case.

(9) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-37. Vacuum pump/motor.

a. Disassembly.

(1) Turn the operating mode selector switch to the "OFF/CHARGE" position.

(2) Disconnect either the power cable or the vehicle power cord from its source of electrical power.

(3) Disconnect the collection canister from the manifold tubing connector and remove it and all other accessories from the suction apparatus case.

(4) Remove the four Phillips screws from the vacuum pump head. Set them aside.

(5) Lift off the vacuum pump head which is connected to the manifold with the vacuum control valve and the vacuum gauge connected to it.

WARNING

Subsequent disassembly procedures may expose you to body fluids if an accidental overflow of the collection canister has occurred. Proceed in accordance with standard unit procedures to clean and disinfect the vacuum pump head.

(6) Remove the eight Phillips screws from the periphery of the control panel. Set them aside.

(7) Lift the control panel from the lower section of the case by gently rocking it back and forth while applying upward pressure around the vacuum pump head gasket. Rest the control panel against the lid.

NOTE

Multiple electrical wires interconnect between the underside of the control panel and the components in the lower section of the case.

(8) Remove the two Keps nuts fastening the battery pack bracket to the chassis using a 3/8-inch extension socket wrench. Set them aside.

(9) Remove the battery pack bracket. Set it aside.

(10) Reposition the battery pack to an upright position within the case (terminals upward).

CAUTION

Reposition the battery pack carefully to prevent inadvertently breaking the electrical wires from their terminals.

(11) Verify that terminal connecting wire colors and battery pack terminal markings match the illustration in figure 3-9.

(12) Pull the red and black wire female spade terminals from the battery pack terminals.

NOTE

The orange wire female spade terminals should remain connected to the battery pack.

(13) Remove the battery pack.

(14) Remove the upper Keps nut fastening the green ground wire to the chassis ground. Set it aside.

(15) Remove the four Keps nuts and flat washers fastening the vacuum pump/motor chassis to the main chassis using a 3/8-inch extension socket wrench. Set them aside.

NOTE

Two Keps nuts were installed on the same screw.

(16) Unsolder the red wire connected to the vacuum pump motor housing terminal.

CAUTION

Ensure that no excess solder is left around the terminal.

(17) Lift the vacuum pump/motor out of the lower case. Set it aside.

b. Maintenance services. Acquire a replacement vacuum pump/motor using the reparable exchange program. No other services on the vacuum pump/motor are authorized at unit level maintenance.

c. Reassembly.

(1) Position the replacement vacuum pump/motor chassis onto the four projecting screws of the main chassis.

(2) Replace the four Keps nuts fastening the vacuum pump/motor chassis using a 3/8-inch extension socket wrench.

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(3) Reinstall the green ground wire ring terminal onto the projecting vacuum pump/motor chassis screw and then fasten it with a Keps nut using a 3/8-inch extension socket wrench.

(4) Solder the red wire to the vacuum pump motor housing terminal.

(5) Place the battery pack into the lower section of the case with the battery pack terminals and colored wire terminals matching figure 3-9.

(6) Reconnect the red and black wire female spade terminals.

(7) Verify the correct battery pack orientation and terminal connections.

(8) Reposition the battery pack onto its side with the terminals facing outward to the side of the lower section of the case.

(9) Reinstall the battery pack bracket onto the two projecting screws.

(10) Reinstall the two Keps nuts.

(11) Reposition the control panel onto the lower section of the case.

CAUTION

Gently rock the control panel to fit it over the vacuum pump.

(12) Reinstall the eight Phillips screws around the periphery of the control panel.

(13) Position the vacuum pump head onto the vacuum pump and reinstall the four Phillips screws.

(14) Reconnect the collection canister to the manifold tubing connector.

(15) Return the rinse bottle and other accessories to the storage compartment of the case.

(16) Close and latch the lid of the suction apparatus case for a nonuse period or prepare it for operation by following the routine start-up procedures in paragraph 2-6.

WARNING

Perform the operational tests listed in paragraph 3-16 prior to patient use.

3-38. Other components.

All other components of the suction apparatus such as the electrical jack, the suction cup feet, the EMI/RFI circuitry, and associated mounting hardware are accessible by following the disassembly procedures in paragraph 3-37a. Reassembly procedures are provided in paragraph 3-37c.

Section X. WIRING

3-39. General.

a. All wires are 18 AWG.

b. Wiring splices are covered with heat shrink tubing.

c. All wires are stripped of the insulating sheath and tinned approximately 0.95 centimeters (0.375 inches).

3-40. Wiring information.

Wiring information including colors, length, connections, and end preparations are provided in table 3-6.

Table 3-6. Wiring information.

Wire No.	Color	Length (inches)	First End Connection	Wire End	Second End Connection	Wire End
1	Black	4.0	Spliced to No. 5 wire	S	"CHARGE" indicator	S
2	Black	4.0	Spliced to No. 5 wire	S	"POWER" indicator	S
3	Black	4.5	Chassis ground	T	Bridge rectifier	S
4	Black	5.5	Bridge rectifier	S	Battery terminal (-)	T
5	Black	11.5	Bridge rectifier	T	6pliced to No. 1 and No. 2 wires	S
6	Black	16.5	Sleeve of jack	S	Battery terminal (-)	T
7	Red	1.25	Motor terminal	S	EMI/RFI filter input	S
8	Red	14.0	EMI/RFI filter output	S	Circuit breaker	S
9	Red	16.0	SIA-4	S	Battery terminal (+)	T
10	Orange	4.0	Battery terminal (-)	T	Battery terminal (+)	T
11	Yellow	18.5	Tip of jack	S	SIA-3	S
12	Blue	6.5	SIA-C	S	Circuit breaker	S
13	Violet	13.5	Bridge rectifier	S	SIA-2	S
14	Gray	2.5	SIB-6	S	"CHARGE" indicator	S
15	Gray	2.5	Circuit breaker	S	"POWER" indicator	S
16	Black	6.0	Chassis ground	S	Control panel	S

Legend: S = solder connection
T = terminal connector

Section XI. STORING AND SHIPPING PROCEDURES

3-41. General.

This section contains the procedures for preparing the suction apparatus for storing and shipping.

3-42. Preparation for storing.

a. Shut down the suction apparatus as follows:

(1) Rotate the "VACUUM ADJUST" control knob fully counterclockwise to decrease the level of vacuum to "0."

(2) Turn the operating mode selector switch to the "OFF/CHARGE" position.

NOTE

The "POWER" indicator will illuminate (providing that the power cable is connected to a 115-volt receptacle).

(3) Disconnect the power cable.

(4) Disconnect the patient suction tube.

(5) Clean, disinfect, and sterilize the suction apparatus, components, and accessories in accordance with the procedures in chapter 2, section V.

b. Inventory the components and accessories. Replace unserviceable or missing items.

c. Reassemble the suction apparatus, repack the case, and coil the power cable on the control panel.

d. Swing the lid of the case downward until it rests on the bottom section. Then, fasten the the two black latches by pushing them inward.

e. Place the power transformer into its cardboard packing assembly, if available.

f. Place the suction apparatus, the power transformer, and the two instruction manuals or technical manuals into the cardboard shipping carton, if available. Otherwise, pack these items into a military chest or other suitable container.

3-43. Preparation for shipping.

a. The suction apparatus, packed in the original shipping carton, is suitable for shipping.

b. The suction apparatus, packed in a military chest or other available container, will be appropriately packed for shipping. Notify your unit transportation point for assistance, if necessary.

CHAPTER 4

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

Section I. GENERAL INFORMATION

4-1. Overview.

This chapter provides for maintenance that is beyond the capability, capacity, and authorization for unit level maintenance personnel. The procedures in this chapter will not be attempted at the unit level.

4-2. Tools and test equipment.

Common tools and test equipment required for support maintenance of the equipment are listed in appendix B, section III. Refer to your unit's MTOE or installation table of distribution and allowances (TDA) for authorized items.

4-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III.

4-4. Expendable supplies.

Expendable and durable supplies and materials for support maintenance are listed in appendix D, section II.

4-5. Repair parts.

Repair parts required for support maintenance are listed in appendix E, section II.

4-6. Special tools.

Special tools required for support maintenance are listed in appendix E, section III.

Section II. MAINTENANCE PROCEDURES

4-7. General.

a. There are no specific troubleshooting procedures for these levels of maintenance.

b. Repair procedures for the vacuum pump/motor have not been developed.

APPENDIX A

REFERENCES

A-1. Army regulations.

AR 40-61	Medical Logistics Policies and Procedures
AR 710-2	Supply Policy Below the Wholesale Level
AR 725-50	Requisitioning, Receipt, and Issue System

A-2. Technical manual.

TM-DPSC-6500-RPL	Medical Materiel: Medical Repair Parts Reference List

A-3. Technical bulletins.

TB MED 7	Maintenance Expenditure Limits for Medical Materiel
TB 8-6500-MPL	Mandatory Parts List for Medical Equipment
TB 38-750-2	Maintenance Management Procedures for Medical Equipment
TB 740-10/DLAM 4155.5/AFR 67-43	Quality Control, Depot Storage Standards, Appendix M, Medical Supplies

A-4. Field manual.

FM 21-11	First Aid for Soldiers

A-5. Supply bulletin.

SB 8-75-( )-series	Army Medical Department Supply Information

A-6. Other publications.

(These publications may be obtained from Commander, U.S. Army Medical Materiel Agency, ATTN: SGMMA-M, Frederick, MD 21702-5001.)

Instruction Manual, Operation and Service, Model 308M Series, Revision E (10/92), Impact Instrumentation Inc., P.O. Box 508, West Caldwell, NJ 07006.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance levels.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions, explanatory notes, and/or illustrations required for a particular maintenance function.

B-2. Explanation of columns in section II.

a. Group Number, Column 1. The assembly group number (Group No.) column is a numerical group assigned to each assembly. The applicable assembly groups are listed in the maintenance allocation chart (MAC) in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance level authorized to perform these functions. The symbol designations for the various maintenance levels are as follows:

C - Operator or crew

O - Unit maintenance

F - Direct support maintenance

H - General support maintenance

D - Depot maintenance

The maintenance functions are defined as follows:

A - Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - Service. To clean, to preserve, to charge, and to add lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - Adjust. To rectify to the extent necessary to bring into proper operating range.

E - Align. To adjust specified variable elements of an item to bring it to optimum performance.

F - Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - Install. To set for use in an operational environment such as tents or International Standards Organization shelters.

H - Replace. To replace unserviceable items with serviceable like items.

I - Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage to a specific failure. Repair may be accomplished at each level of maintenance.

J - Overhaul. Normally the highest degree of maintenance performed by the Army in order to minimize time work in process consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by a maintenance standard in technical publications for each item of equipment. Overhaul normally does not return an item to like new condition.

K - Rebuild. The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance level.

d. Tools and Equipment, Column 4. This column is provided for referencing by code, the tools and test equipment (sec III) required to perform the maintenance functions.

e. Remarks, Column 5. This column is provided for referencing by code, the remarks (sec IV) pertinent to the maintenance functions.

B-3. Explanation of columns in section III.

a. Reference Code, Column 1. This column correlates to section II, column 4.

b. Maintenance Level, Column 2. This column identifies the maintenance levels using the tools and test equipment.

c. Nomenclature, Column 3. This column identifies the tools and test equipment.

d. National Stock Number, Column 4. This column provides the national stock number of the specific tools or test equipment.

B-4. Explanation of columns in section IV.

a. Reference Code, Column 1. This column correlates to section II, column 5.

b. Remarks, Column 2. This column provides supplemental information or explanatory notes pertinent to the maintenance function in section II.

Section II. MAINTENANCE ALLOCATION CHART FOR SUCTION APPARATUS

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A	B	C	D	E	F	G	H	I	J	K	(4) TOOLS AND EQUIPMENT	(5) REMARKS
00	Suction Apparatus	O 0.3	O 0.5		O 0.6				O 0.3	O 1.1	F 3.0	D 6.5	01,02,03 04,05,06, 07	A, B
01	Control Panel Assembly												01,02,03 04,05,06	A, B
	Pump Head		O 0.3	O 0.4						O 0.8				
	Vacuum Adjust Control		O 0.4						O 0.2	O 0.4				
	Vacuum Gauge		O 0.4						O 0.2					
	Power Cable	O 0.2	O 0.2						O 0.5	O 0.3				
	Operating Mode Selector Switch	O 0.3	O 0.5						O 1.0					
	Indicator	O 0.2	O 0.4						O 0.6					
	Circuit Breaker	O 0.2	O 0.4						O 0.6					
	Collection Canister	O 0.3							O 0.2					
	Manifold	O 0.3							O 0.3					
	Tubing	O 0.2							O 0.1					
02	Case	O 0.3							D 1.0				01,02,03	A

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Section II. MAINTENANCE ALLOCATION CHART FOR SUCTION APPARATUS

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A	B	C	D	E	F	G	H	I	J	K	(4) TOOLS AND EQUIPMENT	(5) REMARKS
03	Battery Pack		O 0.6	O 0.3					O 0.9				01,02,04	A
04	EMI/RFI Circuitry		O 0.3						O 1.2	O 0.6			01,02,03, 04,05,06	A, B
05	Vacuum Pump/Motor		O 0.5						O 1.1	F 2.3		D 3.6	01,02,03 04,05,06, 07	A, B
06	Vehicle Power Cord		O 0.2						O 0.1	O 0.3			01,02,04	A

Section III. TOOLS AND TEST EQUIPMENT FOR SUCTION APPARATUS

(1) REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER
01	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Repairmans	5180-00-611-7923
02	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Organizational	5180-00-611-7924
03	F,H	Shop Set, Maintenance Battalion	4940-00-594-6455
04	O,F,H,D	Multimeter, AN/USM 486	6625-01-145-2430
		or	
		Multimeter, AN/PSM 45A	6625-01-265-6000
05	O,F,H,D	Tester, Current Leakage, TS 2514/P	6625-01-142-8233
06	O,F,H,D	Tester, Semiconductor, TS 1836 D/U	6625-00-138-7320
07	O,F,H,D	Calibrator-Analyzer, Hospital Equipment (Test Vacuum Gauge/Test Flowmeter)	6695-01-255-2855

Section IV. REMARKS FOR SUCTION APPARATUS

(1) REFERENCE CODE	(2) REMARKS
A	Tools and test equipment are listed for each assembly group.
B	Perform an annual electrical safety inspection and test. Perform the inspection and test after repair or replacement of electrical/electronic components.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope.

This appendix lists components of end item and basic issue items for the equipment to help you inventory items required for safe and efficient operation.

C-2. General.

The Components of End Item and Basic Issue Items lists are divided into the following sections.

a. Section II. Components of End Item. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the equipment in operation, to operate it, and to perform emergency repairs. Basic issue items must be with the equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request or requisition basic issue items, based on MTOE authorization of the end item.

C-3. Explanation of columns.

The following provides an explanation of columns found in both listings:

a. Item Number, Column 1. This column indicates the item number assigned to the item.

b. National Stock Number, Column 2. This column indicates the national stock number assigned to the item.

c. Description, Column 3. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the commercial and government entity (CAGE) code in parentheses followed by the part number.

d. Unit of Measure, Column 4. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation. These abbreviations are listed in the glossary.

e. Quantity, Column 5. This column indicates the quantity (QTY) of the item(s) provided with the equipment.

Section II. COMPONENTS OF END ITEM FOR SUCTION APPARATUS

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1	5950-01-312-7734	Power Transformer (63346) 023-0015-00	EA	1
2		Strap, Nylon, Black, Webbed (63346) 334-0020-00	EA	2
3		Tubing (63346) 540-0022-00	EA	1
4		Vehicle Power Cord (63346) 708-0001-00	EA	1

Section III. BASIC ISSUE ITEMS FOR SUCTION APPARATUS

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1		Catheter, 14 French (63346) 820-0004-00	EA	1
2		Catheter, 18 French (63346) 820-0005-00	EA	1
3		Patient Suction Tube (63346) 820-0018-00	EA	1
4		Rinse Bottle (63346) 820-0024-00	EA	1
5		Instruction Manual, Operation and Service (63346) 906-0308-02	EA	2

APPENDIX D

EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Scope.

This appendix lists expendable and durable supplies and materials that are required to maintain the equipment. This listing is authorization to requisition and retain the items if not otherwise authorized.

D-2. Explanation of columns.

a. Item Number, Column 1. The item number (Item No.) is sequentially assigned.

b. Level, Column 2. This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.

c. National Stock Number, Column 3. This column indicates the national stock number assigned to the item.

d. Description, Column 4. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

e. Unit of Measure, Column 5. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by an alphabetical abbreviation. These abbreviations are listed in the glossary.

f. Quantity, Column 6. This column indicates the quantity (QTY) of the item(s) provided with the equipment.

Section II. EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST FOR SUCTION APPARATUS

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEASURE	(6) QTY
1	O	7920-01-004-7847	Cloth, Cleaning (97327) Rymple Cloth 301	RO	1
2	O	5970-00-419-4290	Tape, Insulation, Electrical (81349) MIL-I-24391	RO	1
3	O	6840-00-783-0050	Disinfectant, Spray, 7 oz	CN	AR
4	O	6840-00-782-2691	Disinfectant, Liquid, 1 gal	EA	AR

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APPENDIX E

REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

E-1. Scope.

This manual lists spare and repair parts, special tools, special test equipment; and other special support equipment required for the performance of unit level, direct support, general support, and depot level maintenance. It authorizes the requisitioning and issue of spare and repair parts in consonance with the MAC (app B).

E-2. General.

The Repair Parts and Special Tools List is divided into the following sections:

a. Repair Parts, Section II. A list of repair parts authorized for the performance of maintenance in figure number and item number sequence.

b. Special Tools, Test, and Support Equipment, Section III. A list of special tools, test, and support equipment authorized for the performance of maintenance.

E-3. Explanation of columns in section II.

a. Illustration, Column 1.

(1) *Figure Number.* This column indicates the figure number (FIG NO.) of the illustration on which the item is shown.

(2) *Item Number.* This column indicates the item number (ITEM NO.) used to identify each item on the illustration.

b. National Stock Number, Column 2. This column indicates the national stock number assigned to the item.

c. Description, Column 3. This column indicates the federal item name of the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

d. Unit of Measure, Column 4. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

e. Quantity, Column 5. This column indicates the quantity (QTY) of the item(s) to be used with or on the illustrated component, assembly, module, or end item.

E-4. Explanation of columns in section III.

a. Item Number, Column 1. This number is sequentially assigned.

b. Level, Column 2. This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.

c. National Stock Number, Column 3. This column indicates the national stock number assigned to the item.

d. Description, Column 4. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

e. Unit of Measure, Column 5. This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

f. Quantity, Column 6. This column indicates the quantity (QTY) of the item(s) to be used with or on the illustrated component, assembly, module, or end item.

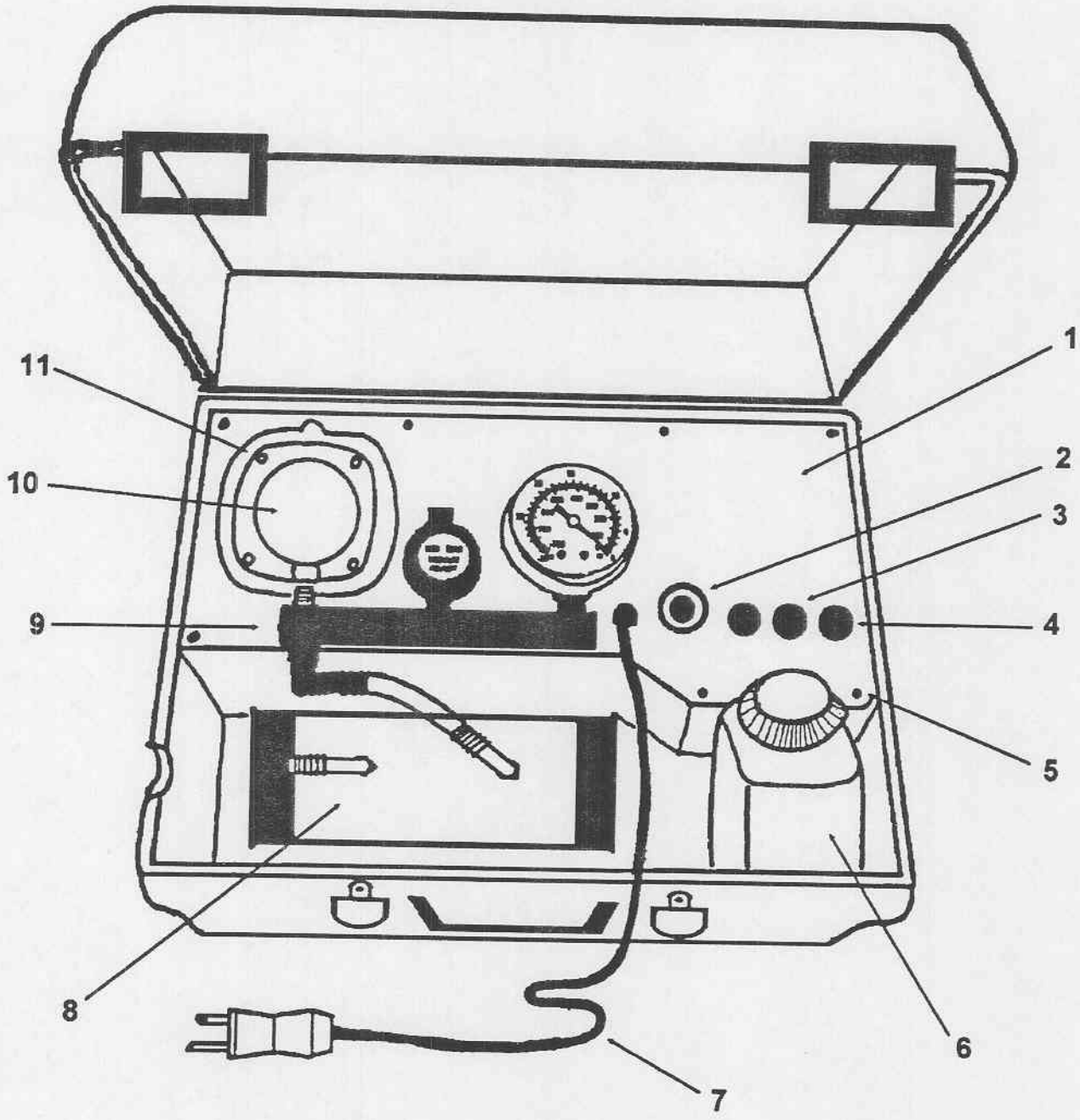

Figure E-1. Suction apparatus with components.

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	1		Control Panel (63346) 422-0308-11	EA	1
E-1	2	5930-01-312-0832	Switch Rotary (Operating Mode Selector Switch) (63346) 117-0005-00	EA	1
E-1	3	6250-01-288-4402	Lampholder (Indicator) (63346) 068-0005-00	EA	2
E-1	4	5925-01-295-3213	Circuit Breaker (63346) 081-0006-00	EA	1
E-1	5		Screw, Phillips, Pan Head, 4-40 by 7/16 in (63346) 358-0440-07	EA	8
E-1	6		Rinse Bottle (63346) 820-0024-00	EA	1
E-1	7	6515-01-312-5808	Power Cable, No. 18 AWG, 74 in L (63346) 708-0004-00	EA	1
E-1	8	6515-01-312-2835	Jar Assembly, Collection (Collection Canister) (63346) 703-0305-11	EA	1
E-1	9		Manifold, Black (63346) 470-0001-00	EA	1
E-1	10	6515-01-312-2836	Pump/motor, Suction (Vacuum Pump/motor) (63346) 041-0006-00	EA	1
E-1	11		Screw, Phillips, Pump Head (63346) 625109	EA	4
E-1	*		Label (Manufacturer Data Plate) (63346) 325-0308-07	EA	1
E-1	*		Grommet, Black (Gasket) (63346) 340-0016-00	EA	1
E-1	*	6210-01-288-4407	Lamp, Incandescent (63346) 068-0004-00	EA	2
E-1	*		Clip, Nylon, Cable, 3/8 in id (63346) 334-0012-00	EA	1
E-1	*		Bushing, Strain Relief, Right Angle (63346) 340-0014-00	EA	1

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	*		Tape, Foam, 1 in W by 1-1/2 L by 3/8 in T (63346) 312-0027-00	EA	1
E-1	*		Cable Tie, Nylon, Miniature (63346) 305-0001-00	EA	5
E-1	*	5920-01-312-0825	Fuse, Cartridge, 3A (63346) 081-0010-00	EA	1
E-1	*		Tubing, 3/8 in id by 9/16 in od by 3-1/2 in L (63346) 540-0037-00	EA	1
E-1	*		Tubing, Shrink, 3/16 in id by 1 in L (63346) 016-0004-00	EA	4
E-1	*		Tubing, Polytetrafluoroethylene Coated Sleeve, No. 18 AWG (63346) 016-0011-00	IN	AR
E-1	*		Tubing, Shrink, 3/16 in id by 2 in L (63346) 016-0017-00	EA	2
E-1	*	6120-01-312-0834	Transformer (63346) 023-0012-00	EA	1
E-1	*	6515-01-343-2125	Filter (EMI Circuit) (63346) 031-0001-00	EA	1
E-1	*	5961-01-289-4488	Semiconductor Device (Diode) (63346) 047-0005-00	EA	1
E-1	*	5910-01-295-3209	Capacitor, Fixed, Electrolytic, 4700 µF (63346) 252-4786-31	EA	1
E-1	*	5910-01-312-0824	Capacitor, Fixed, Electrolytic, 0.1µF (63346) 257-1044-12	EA	2
E-1	*		Insulator, Diode (63346) 310-0012-00	EA	1
E-1	*		Insulator, 1-1/8 in by 3-1/2 in L (63346) 310-0308-01	EA	1
E-1	*		Tape, Foam, 1 in W by 1-1/2 in L by 1/4 in T (63346) 312-0031-00	EA	2
E-1	*		Nut, Keps, 6-32 (63346) 346-0632-01	EA	1
E-1	*		Nut, Keps, 8-32 (63346) 346-0832-01	EA	1

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	*		Nut, Keps, 10-32 (63346) 346-1032-01	EA	5
E-1	*		Screw, Slotted, Undercut, 8-32 by 1/2 in (63346) 359-0832-08	EA	3
E-1	*		Terminal, Ring, No.10, Red (18-22 AWG) (63346) 374-0006-00	EA	2
E-1	*		Terminal, Ring, No. 10, Blue (14-18 AWG) (63346) 374-0016-00	EA	1
E-1	*		Terminal, Ring, No. 4, Red (18-22 AWG) (63346) 374-0018-00	EA	1
E-1	*		Washer, Flat, No. 10 (63346) 376-0003-00	EA	6
E-1	*		Standoff, Self-clinching, Stud, 6-32 by 5/8 in (63346) 378-0632-10	EA	1
E-1	*		Standoff, Self-clinching, Stud, 10-32 by 1/2 in (63346) 378-1032-08	EA	7
E-1	*		Chassis, Sub (63346) 414-0308-31	EA	1
E-1	*		Chassis, Pump (63346) 414-0308-41	EA	1
E-1	*		Jumper, Black (63346) 700-0308-03	EA	1
E-1	*		Jumper, Red (63346) 700-0308-07	EA	1
E-1	*		Jumper, Black (63346) 700-0308-18	EA	1
E-1	*	5920-01-331-8504	Fuseholder Block (63346) 334-0034-00	EA	1
E-1	*		Tubing, Shrink, 3/16 in id by 1 in L (63346) 016-0004-00	EA	2
E-1	*		Tape, Foam, 1 in W by 4 in L by 1/4 in T (63346) 312-0030-00	EA	1
E-1	*		Tape, Foam, 1 in W by 1-1/2 in L by 1/4 in T (63346) 312-0031-00	EA	1

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	*		Nut, Hex, 8-32 (63346) 346-0832-00	EA	2
E-1	*		Nut, Keps, 10-32 (63346) 346-1032-01	EA	4
E-1	*		Screw, Slotted, Binding Head, 10-32 by 1/2 in (63346) 352-1032-08	EA	2
E-1	*		Screw, Phillips, Pan Head, 10-32 by 3/8 in (63346) 358-1032-06	EA	2
E-1	*		Screw, Phillips, Pan Head, 10-32 by 7/16 in (63346) 358-1032-07	EA	2
E-1	*		Bracket, Battery (63346) 404-0308-11	EA	1
E-1	*		Assembly, Battery Pack (63346) 703-0308-13	EA	1
E-1	*		Assembly, Chassis, EMI/RFI (63346) 703-0308-09	EA	1
E-1	*		Jumper, Black (63346) 700-0308-04	EA	1
E-1	*		Jumper, Black (63346) 700-0308-05	EA	1
E-1	*		Jumper, Black (63346) 700-0308-06	EA	1
E-1	*		Jumper, Red (63346) 700-0308-08	EA	1
E-1	*		Jumper, Yellow (63346) 700-0308-11	EA	1
E-1	*		Jumper, Violet (63346) 700-0308-15	EA	1
E-1	*		Tubing, Shrink, 1/4 in id by 1-1/2 in L (63346) 016-0023-00	EA	1
E-1	*		Semiconductor Device (Diode) No. 1N4003 (63346) 047-4003-00	EA	1

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-1	*		Resistor, Carbon Composition, 2 Watts, 5%, 56Ω (63346) 206-0560-03	EA	1
E-1	*		Nut, Keps, 4-40 (63346) 346-0440-01	EA	1
E-1	*		Screw, Phillips, Pan Head, 4-40 by 7/16 in (63346) 358-0440-07	EA	1
E-1	*		Spacer, Bushing (63346) 368-0005-00	EA	1
E-1	*		Terminal, Ring, No. 10, Red (14-18 AWG) (63346) 374-0016-00	EA	1
E-1	*		Knob, w/indicator (63346) 392-0001-00	EA	1
E-1	*		Jumper, Black (63346) 700-0308-01	EA	1
E-1	*		Jumper, Black (63346) 0308-02	EA	1
E-1	*		Jumper, Blue (63346) 700-0308-14	EA	1
E-1	*		Jumper, Gray (63346) 700-0308-16	EA	1
E-1	*		Jumper, Gray (63346) 700-0308-17	EA	1
E-1	*		Assembly, Wire Harness (63346) 703-0308-14	EA	1
E-1	*		Manual, Operation/service (63346) 906-0308-02	EA	2

* Not illustrated.

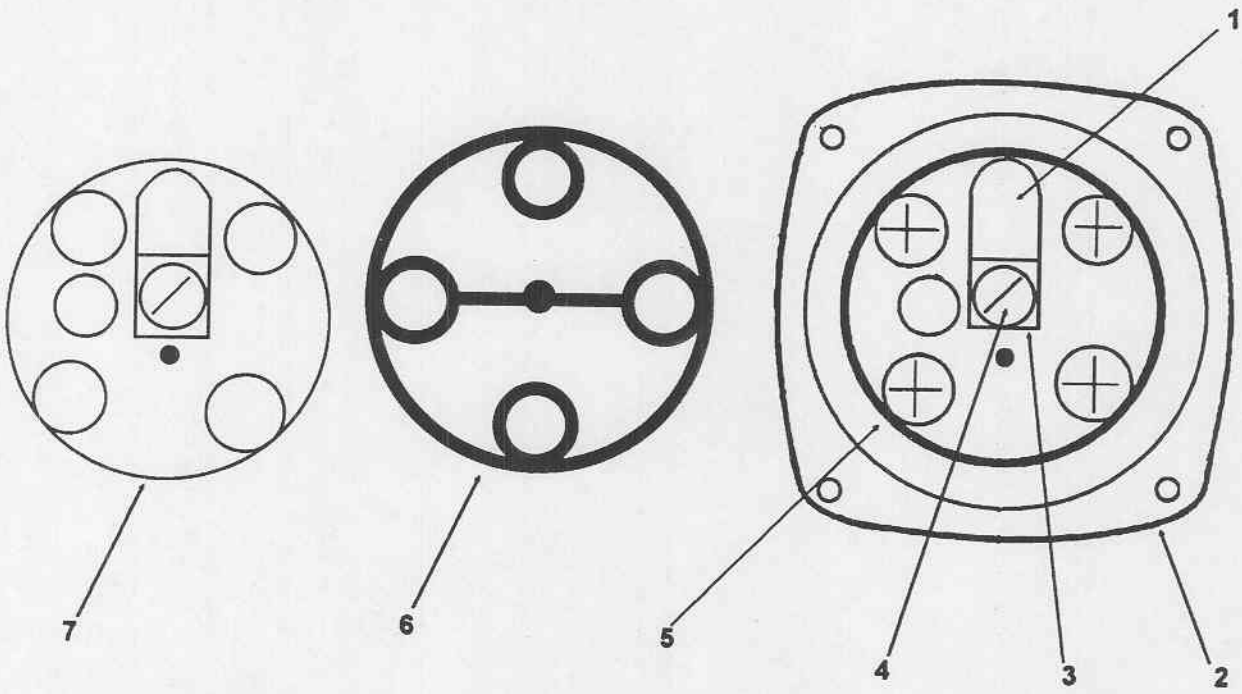

Figure E-2. Vacuum pump head.

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-2	1		Reed Valve (63346) 621102	EA	2
E-2	2		Vacuum Pump Head (63346) 660131	EA	1
E-2	3		Square Reed Valve Plate (63346) 617045	EA	2
E-2	4		Screw, Slotted (63346) 625160	EA	2
E-2	5		Screw, Phillips, Valve Plate (63346) 625141	EA	4
E-2	6		Gasket (63346) 633439	EA	1
E-2	7		Valve Plate (63346) 654129	EA	1

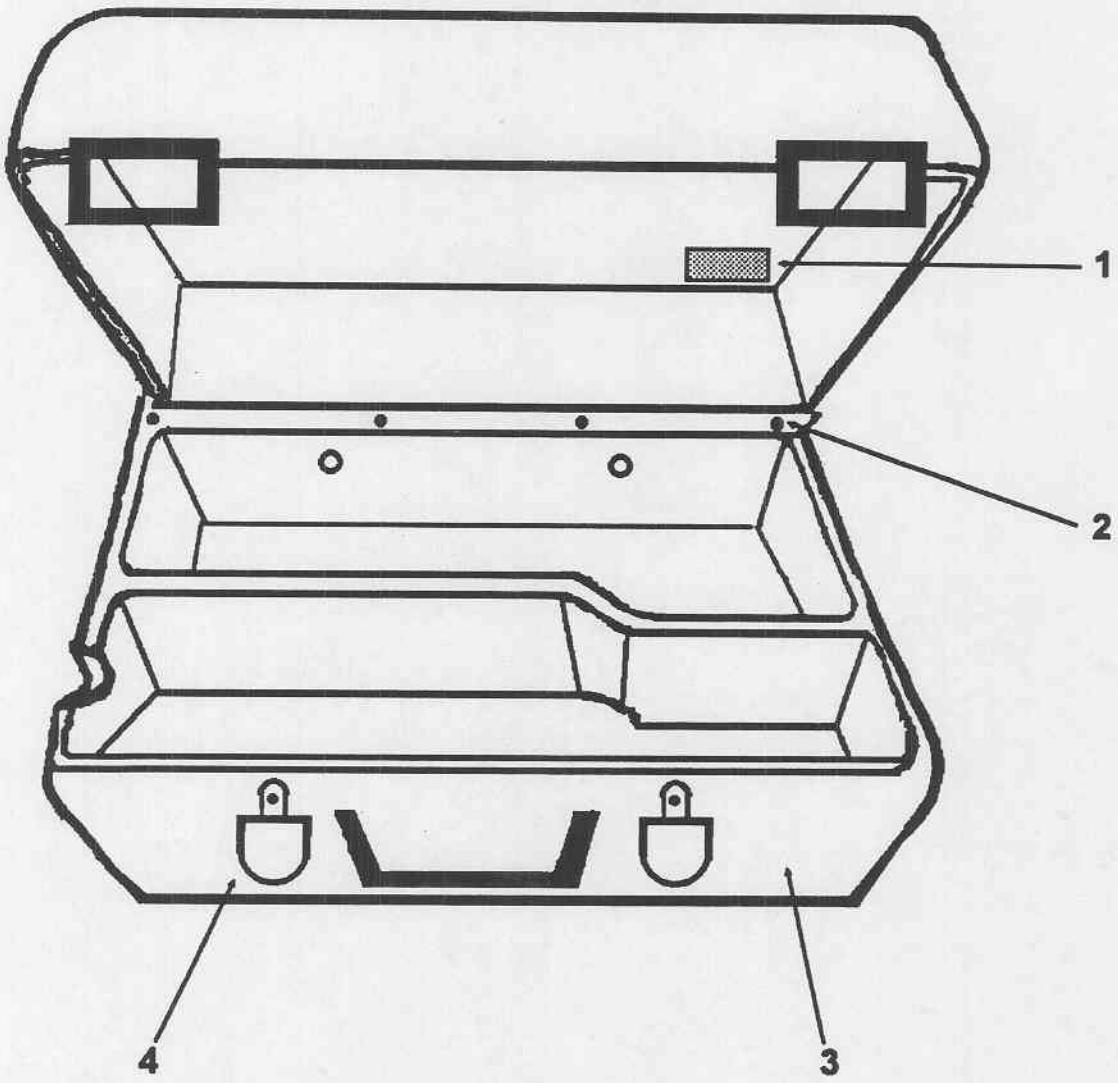

Figure E-3. Case.

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-3	1		Label, Usage Warning (63346) 325-0308-06	EA	1
E-3	2		Insert, Steel, 4-40 (63346) 342-0002-00	EA	8
E-3	3		Case, Modified (63346) 402-0305-11	EA	1
E-3	4		Latch (Fastener), D-ring w/No. 10 Mounting Clips (63346) 394-0005-00	EA	4
E-3	*		Jack, Electrical, 2-conductor, 2.5 mm Post (63346) 089-0007-00	EA	1
E-3	*		Suction Cup, Foot w/8-32 Stud (63346) 450-0007-00	EA	4

* Not illustrated.

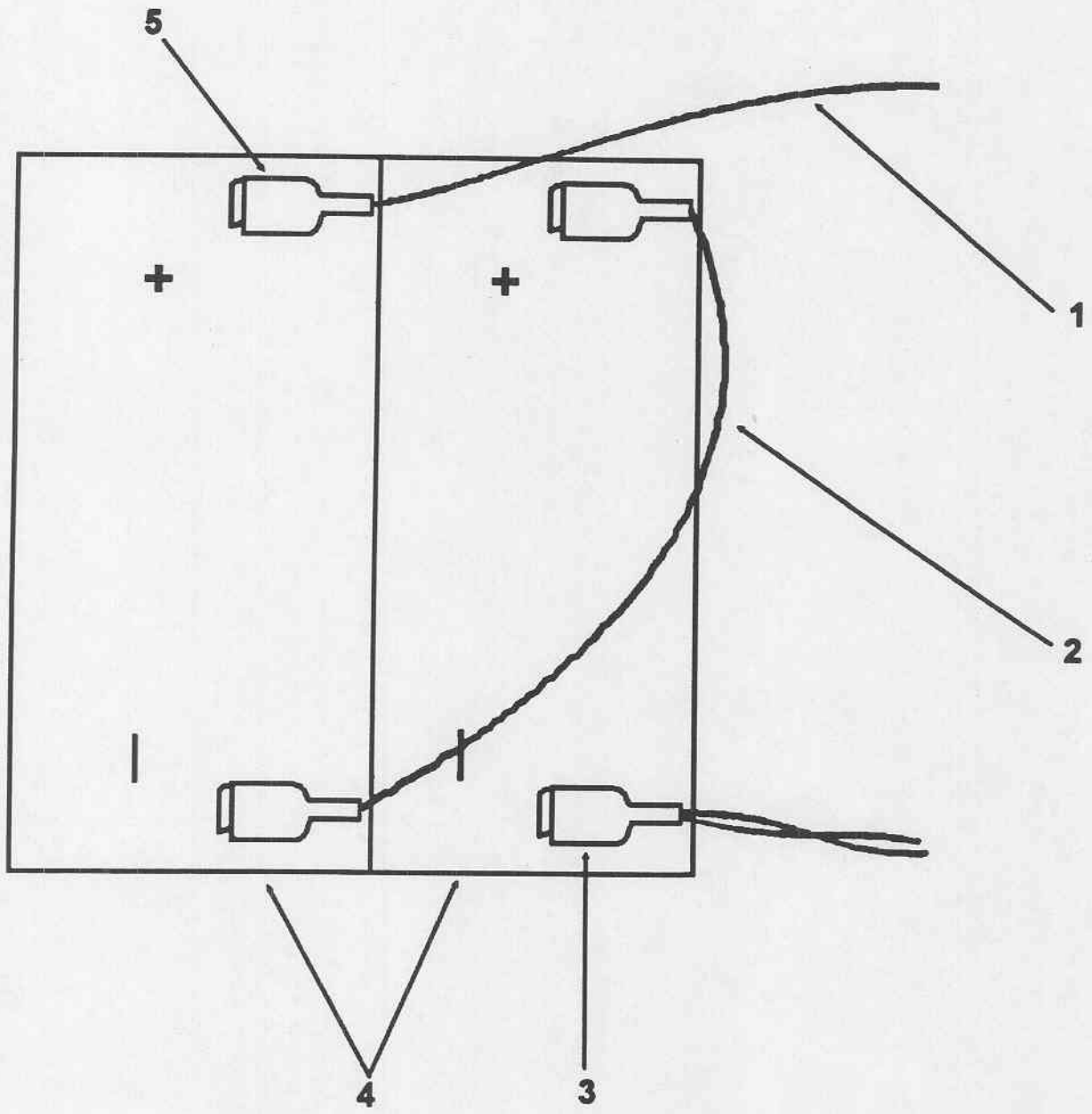

Figure E-4. Battery pack.

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-4	1		Jumper, Red (63346) 700-0308-09	EA	1
E-4	2		Jumper, Orange (63346) 700-0308-10	EA	1
E-4	3		Terminal, Insulated, Female, Blue (63346) 374-0004-00	EA	1
E-4	4	6135-01-312-0948	Battery, Rechargeable (63346) 021-0013-00	EA	2
E-4	5		Terminal, Insulated, Female, Red (63346) 374-0003-00	EA	3

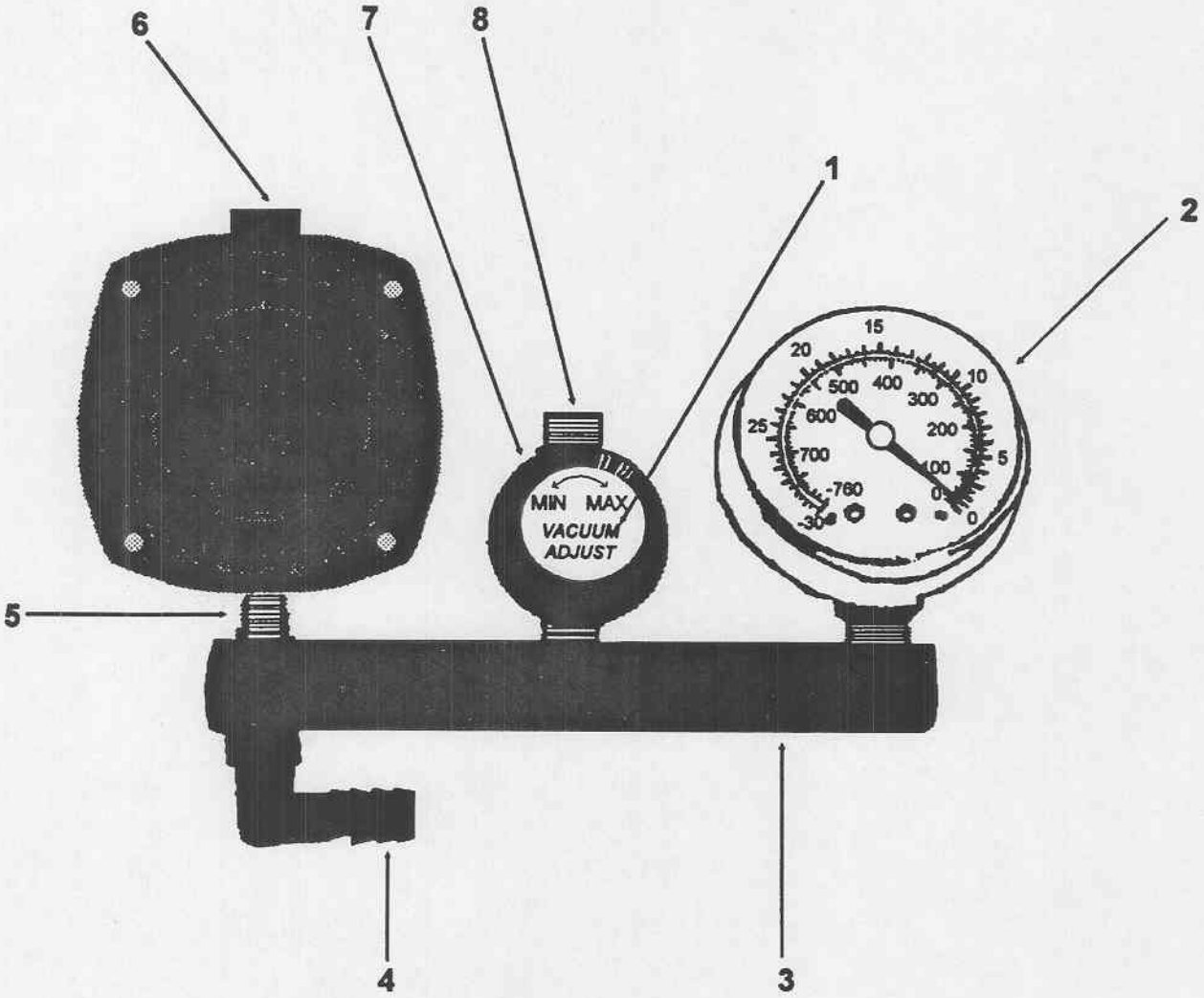

Figure E-5. Manifold.

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Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-5	1		Label, Valve (63346) 325-0305-05	EA	1
E-5	2	6685-01-295-3256	Gauge, Vacuum, w/1/8 in NPT Nipple (63346) 315-0003-00	EA	1
E-5	3		Manifold, Black (63346) 470-0001-00	EA	1
E-5	4	4730-01-312-1238	Elbow, Black, 1/8 in NPT to 3/8 in id Tubing (63346) 480-0065-00	EA	1
E-5	5		Nipple, Close, Chrome, 1/8 in NPT (63346) 480-0132-00	EA	1
E-5	6		Muffler, Aluminum, 1/8 in NPT (63346) 480-0024-00	EA	1
E-5	7	4820-01-295-3224	Valve, Vacuum, Regulating, 1/8 in NPM (63346) 480-0038-00	EA	1
E-5	8		Cap, 1/8 in NPT, Modified (63346) 480-0048-00	EA	1
E-5	**		Assembly, Vacuum Gauge/regulator (63346) 704-0305-02	EA	1

** Includes items 1, 2, 6, 7, and 8.

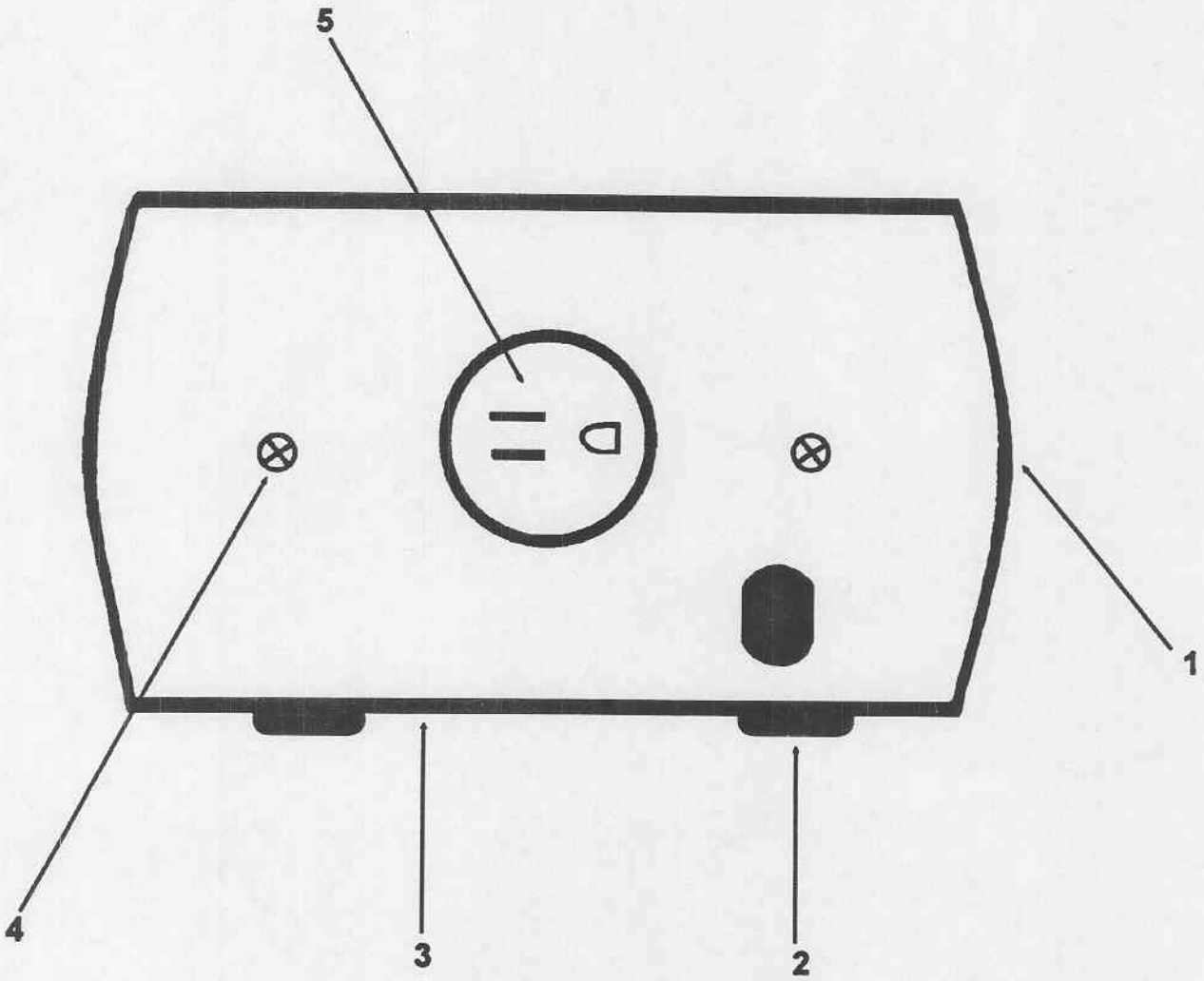

Figure E-6. Power transformer.

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-6	1	5950-01-312-7734	Transformer, Power (63346) 023-0015-00	EA	1
E-6	2		Washer, Flat, No. 4 (63346) 376-0008-00	EA	4
E-6	3		Case (63346) 402-0003-00	EA	1
E-6	4		Screw, Phillips, Pan Head, 6-32 by 3/8 in (63346) 358-0632-06	EA	2
E-6	5		Receptacle, Electrical, Hospital Grade (63346) 089-0013-00	EA	1
E-6	*		Label, Identification (63346) 325-0308-07	EA	1
E-6	*		Label, Wiring Connections (63346) 325-0308-08	EA	1
E-6	*		Nut, Keps, 6-32 (63346) 346-0632-01	EA	2
E-6	*		Nut, Keps, 8-32 (63346) 346-0832-01	EA	2
E-6	*		Screw, Phillips, Pan Head, 4-40 by 1/4 in (63346) 358-0440-04	EA	4
E-6	*		Terminal, Ring, No. 10, Red (18-22 AWG) (63346) 374-0006-00	EA	1
E-6	*		Terminal, Fork, No. 10, Red (18-22 AWG) (63346) 374-0011-00	EA	1
E-6	*		Terminal, Ring, No. 10, Blue (14-18 AWG) (63346) 374-0016-00	EA	1
E-6	*		Stud, Self-clinching, 8-32 by 1/2 in (63346) 378-0832-08	EA	2
E-6	*		Chassis (63346) 414-0308-51	EA	1
E-6	*		Jumper, Black, 5 in L, No. 18 AWG (63346) 700-1308-01	EA	1
E-6	*		Jumper, Green, 7 in L, No. 18 AWG (63346) 700-1308-02	EA	1

Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-6	*		Jumper, White, 4-1/2 in L, No. 18 AWG (63346) 700-1308-03	EA	1

* Not illustrated.

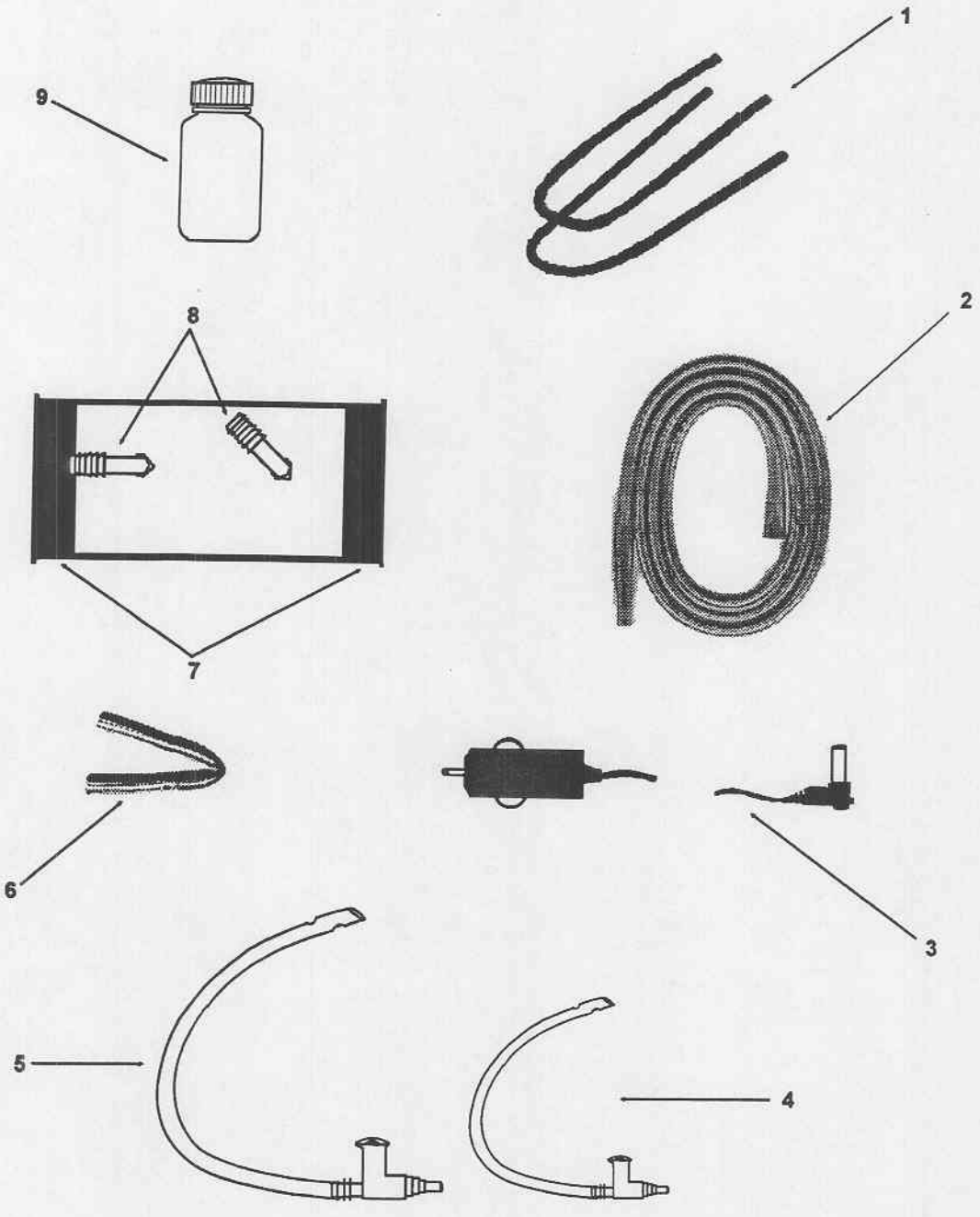

Figure E-7. Components and accessories.

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Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)
FIG NO.	ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION	UNIT OF MEASURE	QTY
E-7	1		Strap, Nylon, Black, Webbed (63346) 334-0020-00	EA	2
E-7	2		Tubing, Patient Suction, Sterile (63346) 820-0018-00	EA	1
E-7	3		Vehicle Power Cord (63346) 708-0001-00	EA	1
E-7	4		Catheter, 14 French (63346) 820-0004-00	EA	1
E-7	5		Catheter, 18 French (63346) 820-0005-00	EA	1
E-7	6		Tubing, 9 in (63346) 540-0022-00	EA	1
E-7	7		End Cap, Suction Canister (63346) 416-0003-00	EA	2
E-7	8		Elbow, Pipe to Tube, 1/8 in NPT to 3/8 in id Tubing (63346) 480-0034-00	EA	2
E-7	9		Rinse Bottle (63346) 820-0024-00	EA	1

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Section III. SPECIAL TOOLS, TEST, AND SUPPORT EQUIPMENT FOR SUCTION APPARATUS

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEASURE	(6) QTY
		THERE ARE NO SPECIAL TOOLS, TEST, OR SUPPORT EQUIPMENT APPLICABLE FOR THIS END ITEM.			

GLOSSARY

A	Ampere
AC	Alternating current
AFR	Air Force regulation
AR	Army regulation
AR	As required
AWG	American wire gauge
BLK	Black
C	Operator or crew
CAGE	Commercial and government entity
chap	Chapter
cm	Centimeter
cm^3	Cubic centimeter
CN	Can
CTA	Common table of allowances
CVC	Calibration/verification/certification
D	Depth
D	Depot level maintenance
D	Diode
DA	Department of the Army
DC	Direct current
DLA	Defense Logistics Agency
DLAM	Defense Logistics Agency manual
DPSC	Defense Personnel Support Center
DS	Direct support
EA	Each

EMI	Electromagnetic interference
EtO	Ethylene oxide
F	Direct support maintenance
fig (FIG)	Figure
FM	Field manual
french (sizes)	The system for sizes of tubes used in endotracheal intubation. A unit of measure equal to 1/3 millimeter.
FSC	Federal supply class
FSCM	Federal supply code for manufacturers. This is an obsolete term. CAGE (commercial and government entity) is the correct acronym.
ft	Foot (feet)
GRN	Green
GS	General support
H	General support maintenance
H	Height
Hg	Mercury
HV	High voltage
Hz	Hertz
id	inner diameter
in	Inch
ISO	International Standards Organization
JTA	Joint table of allowances
Keps nut	A combination nut and washer fabricated as a single unit
kg	Kilogram
L	Length
lbs	Pounds
LPM	Liters per minute
m	Meter

MAC	Maintenance allocation chart
MAN	Manual
MFD	Manufactured
min	Minute
mm	Millimeter
MPL	Mandatory parts list
MTOE	Modified table of organization and equipment
N/A	Not applicable
NO. (No.)	Number
NPM	National pipe (thread) metric
NPT	National pipe thread
NSN	National stock number
O	Unit maintenance
od	Outer diameter
para	Paragraph
PMCS	Preventive maintenance checks and services
p-p	Peak-to-peak
psi	Pounds per square inch
QC	Quality control
QTY	Quantity
R	Resistor
RFI	Radio frequency interference
RO	Roll
RPL	Repair parts list
S	Switch
SB	Supply bulletin
sec	Section

SER.	Serial
T	Thickness
TB	Technical bulletin
TDA	Table of distribution and allowances
Tin	The process of coating bare copper wire(s) with a solder alloy to aid electrical conductivity and mechanical connection
TM	Technical manual
VAC	Volts alternating current
VDC	Volts direct current
W	Watts
W	Width
WHT	White
°C	Degrees Celsius
°F	Degrees Fahrenheit
µF	Microfarad (one-millionth)

INDEX

This index is organized alphabetically by topic and by subtopic. Topics and subtopics are identified by paragraph number.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Cdr, USABBDD
Maintenance Shop
Frederick, MD 21702

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 8-6515-004-24&P	6 Feb 88	Suction Apparatus, Oropharyngeal Model 308M

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
2-6	2-5		
E-11		E-6	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Change electrical cable to electrical assembly.

REASON: Corrects nomenclature.

Reverse call-out numbers 4 and 8.

REASON: Correctly identifies part.

SAMPLE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER
JOHN DOE, Maintenance Supervisor
DSN 343-XXXX

SIGN HERE
John Doe

DA FORM 1 JUL 79 2028-2 PREVIOUS EDITIONS ARE OBSOLETE.

☆U.S. Government Printing Office: 1986—491-003/50523

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

CUT ALONG PERFORATED LINE